INTEGRATION OF ENVIRONMENTAL EDUCATION BY SENIOR PHASE TEACHERS IN SOME SCHOOLS OF NKANGALA DISTRICT

BY

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DECLARATION

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I, *Lettah Sikhosana* declare that the above dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references. I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality. I further declare that I have not previously submitted this work, or parts of it, for examination at Unisa for another qualification or at any other higher education institution.

SIKHOSANA L

SIGNATURE

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“NguSikhosana sikaMusi kaMhlanga, ikomo kaNanasi. Yikunzi wakogwazana, Ngeyagwaza yazinikina kwanga ithaphudaka kanti ithaphimbambo zamanye amadoda. THAMANA MUSI KAMHLANGA!!”

ABSTRACT

The aim of the study was to explore how and why senior phase teachers are capable or incapable of integrating environmental education in teaching and learning. The focus of this study was on teacher's knowledge about environmental education, instructional strategies used and challenges and opportunities experienced when they have to integrate environmental education. The study adopted a qualitative research method, case study design and an interpretative research paradigm. Qualitative data was collected using interviews and lesson observations. Three teachers participated in this study. Pseudonyms were used to protect their identities. A typology approach was utilised to analyse data based on the research questions, themes, conceptual framework, literature review and the personal experience of the researcher. All data collected was analysed and interpreted as a single case using. The study revealed that environmental education is not integrated effectively, teachers who integrate and those that do not integrate encountered challenges and that teachers have inadequate knowledge about the integration of environmental education. Therefore, it is recommended that the school together with teachers introduce continuous environmental education programmes and suggests approaches that can be used to improve their instructional strategies to enable the intergration of environmental education effectively.

Key words: Environmental education. Environment. Integration. Sustainability. Sustainable development. Sustainable education. Learning environment. Instructional strategies. Teacher knowledge. Challenges and opportunities

KHOTSO

Morero oa thuto e ne e le ho hlahloba hore na hobaneng matichere a maemo a phahameng a hokahanya kapa a sa kopanye thuto ea tikoloho ho ruteng le ho ithuteng. Sepheo sa thuto ena e ne e le tsebo ea mosuoe mabapi le thuto ea

tikoloho, maano a ho a sebelisa, liphephetso le menyetla e fumanoeng ha ba tlameha ho kopanya thuto ea tikoloho. Boithuto bo amohetse mokhoa oa ho etsa lipatlisiso oa boleng, thuto ea linyeoe le paradigm ea lipatlisiso. Lintlha tsa boleng li ile tsa bokelloa ho sebelisoa lipuisano le boithuto ba lithuto. Matichere a mararo a nkile karolo thutong ena. Pseudonyms e ne e sebelisoa ho sireletsa boitsebiso ba bona. Mokhoa oa typology o sebelisitsoe ho sekaseka metheo ea data lipotsong tsa lipatlisiso, lihlooho, sebopeho sa mohopolo, tlhahlobo ea lingoliloeng le boiphihlelo ba motho oa mofuputsi. Lintlha tsohle tse bokelletsoeng, li ile tsa hlahlojoa le ho hlalosoa e le nyeoe e le ‘ngoe. Phuputso e senotse hore thuto ea tikoloho ha e kopantsoe ka katleho, matichere a hokahanyang le tse sa kopaneng li bile le mathata le hore matichere ha a na tsebo e lekaneng mabapi le ho kopanngoa ha thuto ea tikoloho. Ka hona, ho khothalletsoa hore sekolo mmoho le matichere ba hlahise mananeo a thuto a tikoloho ka bophara le ho fan aka maikutlo a mekhoa e ka sebelisoang ho ntlafatsa maano a bona a ho ruta ho kopanya thuto ea tikoholo ka nepo.

Mehopolo ea bohlokoa: Thuto ea tikoloho. Tikoloho. Ho kopanya. Khokahano. Nts’etsopele e tsitsitseng. Thuto e tsitsitseng. Tikoloho ea ho ithuta. Mekhoa ea ho ruta. Tsebo ea mosuoe. Liphephetso le menyetla

I-ABSTRACT

Injongo yesifundo yayikukuphononongа ukuba kutheni kwaye kutheni ootitshala benqanaba eliphakamileyo bedibanisa okanye bengadibanisi imfundo yendalo ekufundiseni nasekufundeni. Ugxininiso kolu phando lwalukwimfundo katitshala malunga nemfundo yendalo esingqongileyo, iindlela zokufundisa ezisetyenzisiweyo, imiceli mngeni kunye namathuba afunyanwa xa kufuneka edibanise imfundo yendalo. Uphononongo lwamkele indlela yophando esemgangathweni, uyilo lwamatyala kunye nepharadigm yophando. Idatha yolwazi yaqokelelwa kusetyenziswa udliwanondlebe kunye nokujonga izifundo. Ngootitshala abathathu abathathe inxaxheba kolu phando. I-pseudonyms

yasetyenziswa ukukhusela ubuqu babo. Indlela yokuchwetheza isetyenziselwe ukuhlalutya iziseko zedata kwimibuzo yophando, imixholo, isikhokelo sekhonkco, uphononongo loncwadi kunye namava obuqu omphandi. Yonke idatha eqokelelweyo, yahlalutywa kwaye itolikwa njengecala elinye. Olu phando luveze ukuba imfundo yendalo esingqongileyo ayihlangananga kakuhle, ootitshala abadibanisa kunye nabangazidibanisi nemiceli mngeni kwaye ootitshala abanalwazi lwaneleyo malunga nokudityaniswa kwemfundo yendalo esingqongileyo. K ngoko kucetyiswa ukuba isikolo kunye nabafundisi-ntsapo bazise iinkqubo zokufunda zokusingqongileyo kwaye bacebise ngeendlela ezinokuthi zisetyenziselwe ukuphucula izisetyenziselwe ukuphucula izicwangiso zabo zokufundisa ukulungiselela ukudityaniswa kwemfundo yendalo esingqongileyo ngempumelelo.

Amagama aphambili: Ukufunda ngendalo. Indawo esingqongileyo. Umdibaniso. Ukomelela. Uphuhliso oluphathekayo. Imfundo ezinzileyo. Indawo yokufunda. Iindlela zokufundisa. Ulwazi lukatitshala. Imiceli mngeni kunye namathuba

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LIST OF ACRONYMS

SDGs: Sustainable Development Goals

UN: United Nations

UNESCO: United Nations Educational, Scientific and Cultural Organizations

IUCN: Union for Conservation of Nature

CEE: Council for Environmental Education

UNEP: United Nations Environmental Programme

IEEP: International Environmental Education Programme

FAO: Food and agriculture organization

OAE: Outdoor Adventure Education

STAD: Student Team's Achievement Division

ABET: Adult Education and Training Centres

HE: Higher Education

NCS: National Curriculum Statement

RNCS: Revised national curriculum statement

GET: General Education and Training

CAPS: Curriculum Assessment Policy Statement

FET: Further Education and Training

ESD: Education for Sustainable Development

EE: Environmental Education

MAIN: Mind Artifact Institutional Nature

ECD: Early Childhood Development

DHET: Department of Higher Education and Training

DBE: Department of Basic Education

RNPE: Revised National Policy on Education

SACE: South African Council for Educators

NEEP: National Environmental Education Programme

MoE: Ministry of Education

B.Ed: Bachelor of education

PGCE: Post-graduate Certificate in Education

PDE: Provincial Departments of Education

DRFN: Desert Research Foundation of Namibia

NBR: Natural Resources Board

EMA: Environmental Management Agency

CHAPTER 1
BACKGROUND OF THE STUDY

1.1. INTRODUCTION

This chapter presents the background of the study, the problem statement, theresearch questions, rationale, aims and objectives of the study, delimitations, chapter outline and concludes with the summary.

1.2. BACKGROUND

“The 2030 Agenda and the Sustainable Development Goals are our collective response to building a fair globalization” (United Nations, 2019: 17), this was said by António Guterres, the United Nations Secretary-General. He said this during the meeting of head of states and governments that were gathered at the UN summit to discuss and review the progress of the implementation of the 2030 Agenda for Sustainable Development and the 17 Sustainable Development Goals (SDGs). These discussions reinforce the fact that deliberations on the sustainability of our planet are ongoing and are of a serious nature on a macro level.

At the micro level it is the responsibility of teachers, environmental activists and non-government organisations to teach the public about environmental issues that we face and advocate for sustainable development (Tshautshau, 2013). Furthermore, it is important to acknowledge that environmental education has a huge potential for transforming and rethinking education in a manner that changes human lives towards sustainability (United Nations Educational Scientific and Cultural Organisation [UNESCO], 2015).

The world on its own is embedded with various environmental issues that are harmful such as pollution, deforestation, natural disasters, climate change, loss of biodiversity and overpopulation. These environmental education issues led to the formation of World Environmental Education Day, whereby schools, environmental education centres and public institutions gather together in order to develop educational actions to shape transversal skills and to make people characters of

change by being more environmentally friendly (World Environmental Education Congress [WEEC], 2018). Therefore, solutions to these environmental issues can be achieved through acquiring adequate knowledge about environmental education (Loubser, 2016). Hence, it is important to raise awareness about environmental issues since environmental education is already a part of the school curriculum and is integrated across all subjects. Therefore, it is important to ensure that the effectiveness of determining environmental education initiatives is taken into consideration, especially in South Africa (Makokotlela, 2016). As a result, this study explored how senior phase teachers integrate environmental education into their teaching and learning practices.

1.3. PROBLEM STATEMENT

The integration of environmental education is embedded with challenges such as inadequate knowledge of what environmental education entails (Msezane, 2014). This situation was not different to what was encountered during the researchers' training to be a teacher from the schools where they acquired their teaching practice. It was observed that there was minimal or no integration of environmental education in the teaching and learning process. Therefore this study explored how senior phase teachers integrate environmental education in their teaching and learning.

1.4. RESEARCH QUESTION

1.4.1. MAIN RESEARCH QUESTION

1. How do senior phase teachers integrate environmental education in their teaching and learning?

1.4.2. SUB-QUESTIONS

1. What is the nature of the teachers' environmental education knowledge?
2. What teaching strategies do teachers use when integrating environmental learning in the teaching and learning process (if they integrate environmental education)?

3. What challenges and opportunities do teachers have when integrating environmental education?
4. What challenges do teachers have when they are not integrating environmental education?

1.5. RATIONALE

The findings from this study may assist teachers in developing a positive approach to the process of ongoing attempts and the will to integrate environmental education. It may expose the kinds of knowledge other teachers have of what entails environmental education and its integration in school subjects as well as the instructional strategies they use. The focus on the challenges and the opportunities may excite teachers in that those who have similar circumstances would use the findings from this study as a launch pad to work on their strengths or weakness in the endeavour to integrate environmental education.

1.6. AIMS AND OBJECTIVES OF THE STUDY

- The main aim of this research is to explore how senior phase teachers integrate environmental education in their teaching and learning.

In order to achieve this aim, the objectives for this research are to:

- Explain the nature of teachers' knowledge in relation to the context and the content of environmental education.
- Describe teaching strategies that teachers use when integrating environmental education (if they integrate environmental education).
- Investigate challenges and opportunities that teachers have when integrating environmental education in teaching and learning.
- Investigate the challenges that teachers have when they are not integrating environmental education.

1.7. DELIMITATIONS OF THE STUDY

This study focused on interviewing and observing lessons of three Grade 7 teachers at one selected senior phase school only. These teachers were interviewed and observed during the teaching and learning process. The study took place in the Nkangala district, Mpumalanga province.

1.8. CHAPTER OUTLINE

This section contains a preliminary chapter outline that was included in this research study.

Chapter 1: This chapter presents the introduction and background of the study, its rationale, and statement of the problem, research questions as well as aims and objectives.

Chapter 2: This chapter presents the literature review that is used in this study as well as the conceptual and theoretical framework that has been implemented.

Chapter 3: This chapter presents the research methodology and design that was used in this study as well as research ethics.

Chapter 4: This chapter presents the research findings and a discussion of the results.

Chapter 5: This chapter presents the conclusions, recommendations and limitations of the study.

1.9. SUMMARY

Chapter 1 discussed the background of the study, the problem statement, research question, rationale, aims and objectives and delimitations of the study. The chapter concluded with a chapter outline and a summary. In the next chapter, the literature reviewed is presented.

CHAPTER 2
LITERATURE REVIEW

2.1. INTRODUCTION

The previous chapter entailed the background of this study and this chapter reviews the literature conducted in relation to the study. It analyses the historical developments of environmental education, it describes environmental education, the perceptions of environmental education and the failures of environmental education. It also explains environmental learning, sustainable development and education for sustainable development. Furthermore, It analyses the development and the incorporation of environmental education internationally, such as in the United States of America and Australia. It analyses the development and incorporation of environmental education by Southern African countries such as Botswana, Namibia, Swaziland and Zimbabwe. It also analyses the development of environmental education in South Africa. It looks at the South African school system, the integration of environmental education in senior phase schools in South Africa, the teaching strategies that are used in teaching and learning as well as the benefits of integrating environmental education. Then, this chapter concludes with the conceptual framework utilized in this study.

2.2. HISTORICAL DEVELOPMENTS OF ENVIRONMENTAL EDUCATION

Numerous studies have been conducted about the history and development of environmental education. A study that was conducted by McCrea focuses on the roots of environmental education, taking into consideration how the past supports the future since the roots of environmental education are diverse and extremely broad (McCrea, 2006). Furthermore, a study that was conducted by Carter and Simmons focuses more on the history as well as the philosophy of environmental education (Carter & Simmons, 2010). This clearly shows that environmental education cannot be considered as a contemporary subject matter as it can be traced back to the 18th century (Essays, 2018).

As a result, it was important for this study to look at the historical development of environmental education:

Years	Description
1948	The International Union for Conservation of Nature (IUCN) was founded.
1949	The early influence of environmental education can be traced back into the first International Union for Conservation of Nature (IUCN) conference that was held in Paris, whereby the concept of environmental education was first used
1965	A conference was held at Steffordshire Keele University with the main aim of exploring environmental education and its consequences for education.
1970	A remarkable step forward for the development of environmental education was drawn in a conference that was called by the IUCN-The World Conservation Union in Nevada, whereby the founding of the Council for Environmental Education (CEE) took place in the United Kingdom. In 1970, the CEE focused on addressing the following three broad goals: a. Development: CEE aims to facilitate the development of the theory and practice of environmental education. b. Promotion: CEE aims to promote the concept of environmental education and facilitate its application in all spheres of education. c. Review: CEE aims to monitor the progress of environmental education and assess its effectiveness in all educational spheres. The accomplishment of these goals led to the development of the concept of environmental education towards the promotion of its legitimacy.
1971	The United Nations Educational, Scientific and Cultural Organizations (UNESCO) held a Biosphere conference in Paris which concluded with a report from IUCN which declared world-wide awareness of environmental education.

	The conference that was called by IUCN-The World Conservation Union in Nevada described environmental education as the process of acknowledging values and clarifying concepts that are appropriate in order to develop adequate skills, knowledge, values and attitudes towards understanding and appreciating the relationship between human beings, their culture and environmental surroundings.
1975	The United Nations Environmental Programme (UNEP) was established which led to the launch of the International Environmental Education Programme (IEEP) which took place at the International Workshop on Environmental Education that was held in Belgrade by UNESCO. As a result, environmental education became popular during the world's first inter-governmental conference on environmental education that was held in Tbilisi.
1977	UNESCO organised a conference in co-operation with the United Nations Environmental Programme. During this conference, a framework, guidelines and principles for the integration of environmental education at all levels; locally, nationally, regionally and internationally, both inside and outside of the formal school system were drafted to ensure that people are actively involved towards the sustainability of education. This gave a foundation for the Tbilisi declaration to identify 12 guiding principles that should be embedded in environmental education. The declaration emphasised that the 12 guiding principles in environmental education should: a. Be a continuous lifelong process starting at pre-school level continuing through all formal and non-formal stages. b. Focus on current and potential environmental conditions while taking into consideration historical viewpoints. c. Utilise diverse learning environments and a broad collection of educational approaches to teaching, learning about and from the

	environment with due stress on practical activities and first-hand experience. d. Promote the value and necessity of local, national and international co-operation in the prevention and solution of environmental issues. e. Relate environmental sensitivity, knowledge, problem solving skills, values and attitude clarification to every age, but with special focus on environmental sensitivity to the learners' own community in early years. f. Help learners to discover real causes of environmental issues. g. Emphasise the complexity of environmental problems and the need to develop critical thinking and problem solving skills. h. Enable learners to have a role in planning their learning experiences and provide opportunities for decision making and accepting consequences. i. Explicitly consider environmental aspects in plans for development and growth. j. Be interdisciplinary in its approach towards making holistic and balanced perspectives possible. k. Consider the totality of the environment in its natural, built, social and technological aspects.
1977	UNESCO compiled a final report on the Tbilisi principles which set out three goals of environmental education: a. To provide every person with opportunities to acquire the knowledge, skills, values, attitude and commitment that is needed to protect and improve the environment. b. To create new patterns of behaviour amongst individuals and society towards the environment. c. To foster awareness of, and concern about, social, political, economic and ecological interdependence in urban and rural areas. These goals formed a guideline for teachers to have a role in their teaching experience and provide learners with opportunities to make decisions, solve problems and accept their consequences.

1980	The IUCN, UNEP, FAO and World Wildlife Fund launched the World Conservation Strategy which became the major international initiative. The World Conservation Strategy focused on the importance of conserving resources through sustainable development. As a result, the long-term task of environmental education was to nurture behaviour and attitudes that are well-matched with the new ethic.
1987	The World Commission on Environmental education concluded that the changes in human attitude mainly depend on a huge campaign of education, debate and public participation.

This study was guided by the following Tbilisi principles that were integrated:

Tbilisi principles that guide this study	**The integration of Tbilisi principles**
Be a continuous lifelong process beginning at pre-school level and continuing through all formal and non-formal stages.	This study looks at the teacher knowledge focusing on the environment, integration, environmental education and the integration of environmental education as well as the misconceptions that have been developed about environmental education.
Utilise diverse learning environments and a broad collection of educational approaches to teaching, learning about and from the environment with due stress on practical activities and first-hand experience.	This study looks at how teachers made use of different learning environments, instructional strategies and relating environmental education to real life situations during instruction.
Emphasise the complexity of environmental issues and the need to develop critical thinking and problem-solving skills.	This study explores the challenges and opportunities that teachers experience when they integrate environmental education and the strategies they used in order to overcome those challenges.

2.3. ENVIRONMENTAL EDUCATION

Environmental education is a process that enables individuals to discover environmental problems, participate in problem solving and take necessary actions needed to solve those problems (Environmental Protection Agency, 2017). It is a lifelong learning and holistic process that focuses on creating responsible individuals who are able to identify environmental issues and take action to effectively to improve the environment (Abboud, 2018). Environmental education is important as it includes practice in the decision-making process and self-formulation of a code of behaviour about issues that concern environmental quality (Neal & Palmer, 2003). As a result, environmental education should be the most integral part of the educational process, as it is aimed at practical problems of an interdisciplinary character, builds a sense of values, and contributes to public well-being (Kapoor, 2011).Thus being said, it is clear that the aim is not just to solve a problem with a narrow focus that makes another problem worse, but to make things better. In this study, the focus is to find out how teachers integrate environmental education, taking into consideration the teachers' knowledge about environmental education, instructional strategies that they used and the challenges as well as opportunities that teachers experience when they integrate environmental education.

According to the Tbilisi Declaration, the following objectives of environmental education were identified in the conference that was held (Tbilisi Declaration, 1977). The objectives were as follows:

Awareness: to support individuals and social groups to acquire awareness of and sensitivity to the environment as a whole and its associated problems.

Knowledge: to help individuals and social groups acquire basic understanding of the environment, its associated problems and humanity's critically responsible presence and role on it.

Attitude: to help individuals and social groups acquire social values, strong beliefs of concern for the environment and motivation for actively participating in its protection and improvement.

Skills: to help individuals and social groups acquire the skills for solving environmental problems.

Evaluation ability: to help individuals and social groups evaluate environmental measures and education programmes in terms of ecological, political, economic, social, aesthetic and educational factors.

Participation: to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems in order to ensure appropriate action is taken to solve those problems.

Furthermore, in 1977 the Tbilisi Declaration stated that the principal audience of environmental education was the general public, which has two major categories, namely:

1. Formal education sector: this sector includes pre-school, primary, secondary and higher education students as well as teachers and environmental professionals in training and retraining.
2. Non-formal education sector: this includes youths and adults, individually or collectively, from all segments of the population such as family, workers, managers and decision-makers in environmental as well as non-environmental fields.

These two main categories of environmental education have a huge impact in this study as the study was aimed at finding out how teachers integrate environmental education. The formal education sector has an influence in this study as this study

takes place in a primary school whereby three teachers encompassed the cases this study analyses.

The National Environmental Education Act of 1990 describes environmental education as a process that allows individuals to explore environmental problems, engage in problem-solving and take actions to develop the environment. As a result, it is important for teachers to understand that environmental education does not only drive a particular viewpoint, it also provides opportunities to learn how to measure different sides for different issues so that teachers are encouraged to be critical thinkers in a sense that they are able to solve problems and enhance their decision-making skills.

2.4 PERCEPTIONS ON ENVIRONMENTAL EDUCATION

A qualitative study of the experience of 23 Outdoor Adventure Education (OAE) was conducted to determine what participants found important about their course and elements they attributed in relation to environmental education (D'Amato & Krasny, 2011)**.** The study revealed that participants experienced personal transformations which resulted in spending extended time in nature and separation of the course from normal life (D'Amato & Krasny, 2011). The outcomes related to personal growth and an increase in changes in environmental behaviours were consistent with participant motivation for joining OAE courses with most activities.

In a study that was conducted by Archibald and Gundlach (2018) they examined an integrated approach on environmental education and concluded that environmental education must be both pervasive and integrated. It was proposed that if a child acquires a particular broad environmental understanding and knowledge, they will develop a social conscience attitude that will affect actions towards the environment as a whole. As a result, they suggest that an integrated, interdisciplinary instructional program should be developed in environmental education, designed to promote an environmental awareness and sociological attitude.

According to D'Amato and Krasny (2011) in a qualitative study that they conducted, is was clearly indicated that a person will always respond differently in a new environment. Therefore, if teachers are able to engage learners in OAE activities they will not only assist learners in realising their full potential, but it will also provide them with knowledge and skills that they can use to empower themselves. As a result, a common response to the OAE will not be the same nor accurate because many participants transform their personal experiences when they are engaged in new natural settings. This results in them being able to reach their full potential in a manner that they can acknowledge their new abilities when they are engaged in a new environment.

However, a lack of human capacity and resources by a majority of schools across the country has emerged, which led to assumptions that even though South Africa has decent policies to fulfil the integration of environmental education, the implementation level of these policies is lagging behind (Tshautshau, 2013). Therefore, it is important to acknowledge participants' different attributes when conducting this study since their knowledge about environmental education is not the same. Their public perceptions of environmental education are embedded with a lot of misconceptions due to challenges that teachers encounter. As a result, it is clear that environmental education is the most important aspect in the field of education as it can contribute towards addressing misconceptions that teachers had.

2.5 THE FAILURES OF ENVIRONMENTAL EDUCATION

According to Saylan (Saylan, 2011), environmental education has failed because:

a. it is not keeping pace with environmental degradation.
b. schools have failed to practice what they teach as they neglect education in and for the environment.
c. it neglects the effectiveness of the environment and is more concerned with environmental problems rather than finding solutions to overcome and resolve such problems.

2.6 ENVIRONMENTAL LEARNING

A learning environment is made up of the diverse physical locations, cultures and contexts in which learners learn. In this study, the researcher conducted interviews and lesson observations in different learning environments. This had a direct and indirect influence on the study based on how environmental education was integrated. Thus, it is the responsibility of a teacher to ensure that what they teach is relevant to the present and future lives of learners to ensure sustainable development.

Environmental learning is education about the environment, in the environment and for the environment with the main aim of integrating environmental education (Institute for environmental learning, 2011). The Institute for environmental learning promotes:

- Making informed and responsible choices
- Integrating science and social sciences with a multi-disciplinary approach
- Identifying individual's cultural values
- Critiquing societal and industrial practices that contribute to environmental problems
- Learning about the Earth's ecosystems

According to Lucas, education about the environment, education in the environment and education for the environment are important approaches to environmental education (Lucas, 1979):

- **Education about the environment:** is mainly concerned with providing enough information about the environment and the environmental problems. Learning about the environment supports individuals to develop an understanding of the environment, its challenges and the solutions needed in decision-making.
- **Education in the environment:** is focused on any form of teaching and learning that takes place outside of the classroom environment which can be

taught in a practical manner through direct experience as it has strong links with outdoor education.

- **Environmental learning as an education for the environment:** it develops attitudes and values which trains individuals to make choices that maintain and improve the quality of the environment as it seeks to change the behaviour of individuals towards the environment. Education for the environment needs to teach and encourage people to take part in environmental activities and to believe that their efforts can have an impact on the environment.

As a result, environmental learning cannot take place in a classroom environment only, but it can take place anywhere, from formal learning environments to informal learning environments which include parks, environmental programs, nature centres and much more.

According to Vermetten et al., (2002) a high-quality learning environment should:

- Encourage activity and should involve learners in an integrative and interactive way.
- Contain models and coaching which should be delivered by an expert teacher.
- Be functional and match as closely as possible to the situations in which learning is applied.

Therefore, teachers need to make use of different approaches and skills in environmental education integration to ensure that learners can be motivated to be more innovative and creative in a manner such that they are given an opportunity to organise their own learning.

2.7 SUSTAINABLE DEVELOPMENT

Sustainable development is defined as development that focuses on meeting the needs of the present without compromising the needs of the future generation. (World Commission on Environment and Development, 1987). The main aim of sustainable development is to balance economic, environmental and social needs,

allowing prosperity for now and future generations as it encourages individuals to conserve and enhance resources (World Commission on Environment and Development, 1987). The World's Governments (2015) adopted the Sustainable Development Goals, a universal 2030 Agenda whereby a majority of countries signed 17 goals that are committed to a shared vision of sustainable development. Some of these goals that shape the study are:

- Goal 4: Quality education
- Goal 9: Industry, innovation and infrastructure
- Goal 11: Sustainable cities and communities
- Goal 15: Life on land.
- Goal 17: Partnership for the goals

In this study, sustainable development is about ensuring dignified living conditions with regards to human rights by creating and maintaining the possible range of options for a freely defining life plan. The principle of fairness among and between present and future generations should be taken into consideration in the use of environmental, economic and social resources (Swiss Monitoring of Sustainable Development Project, 2001).

According to Kain (2003) and Stenberg (2001) the development of Mind, Artifact, Institutional and Nature (MAIN) prism for sustainable development described:

- **M**ind: as a social dimension that encompasses the awareness of the individual subject, world view, knowledge and experience.
- **A**rtifact: as economic, which stands for all man-made material assets such as buildings.
- **I**nstitutional: as a dimension that is concerned with the organisation of society and the relationships between people.
- **N**ature: as the environmental dimension which includes all natural capital sub-divided into stocks of non-renewable and renewable resources.

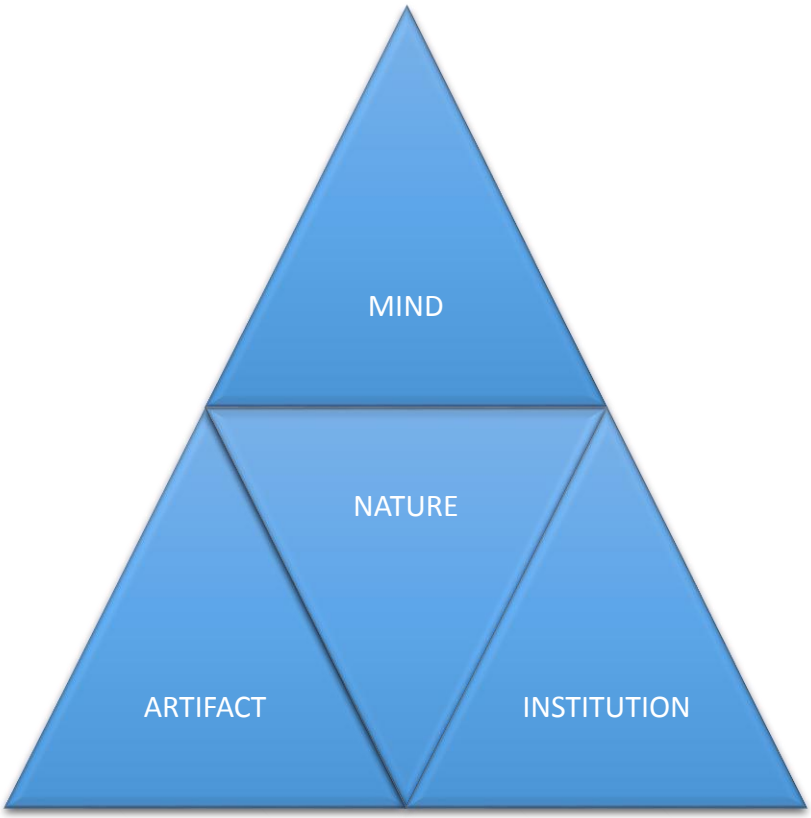

Figure 1: Main prism of sustainable development (Kain 2003 & Stenburg, 2001).

Using the MAIN prism of sustainable development, the study manages to point out the interaction of the four dimensions through the process of environmental education integration. Only by regarding all four dimensions simultaneously can sustainable development be achieved (Stenberg, 2001). In order to ensure that the concept of sustainable development is taken into consideration in this study, the dimension of mind represents the knowledge, world view and the experience that teachers have when it comes to the integration of environmental education in teaching and learning. The artifact dimension represents the school since it is a man-made asset, and the school is the most important setting to ensure that the case study took place. The institution comprises of teachers and the learners as teachers serve as the participants in order to find out how they integrate environmental education in their teaching and learning. Nature dimension focuses on the environment in which teaching and learning takes place. These dimensions

are important in this study as they interact simultaneously to ensure that there is sustainable development.

2.8. EDUCATION FOR SUSTAINABLE DEVELOPMENT

In this study, Education for Sustainable Development (ESD) is used to describe the practice of teaching to ensure sustainability. ESD is important in the field of education as it provides a solid foundation towards ensuring that development that takes place in education is able to meet the needs of the current generation without having to compromise the needs of the future generation towards education. Therefore, ESD can be used as a key component to motivate teachers and learners to acknowledge the environmental challenges that are present in schools and communities in order to come up with approaches to overcome them.

Education for sustainable development consists of integrating key sustainable development issues into teaching and learning which includes poverty reduction, sustainable consumption, disaster risk reduction, biodiversity and instruction about climate change (UNESCO, 2017). These ESD issues can be overcome by ensuring that there is sufficient participation in the teaching and learning process. ESD not only ensures sustainable development but it also encourages and empowers teachers to know how to adapt to change, in such a manner that they are able to change the way they see the environment and acknowledge their abilities, values and the importance of sustainable development.

The ESD supports individuals to acquire adequate problem-solving skills, critical thinking skills, decision making skills and creative thinking skills that they can use to combat the environmental challenges in environmental education (United Nations Decade of Education for Sustainable Development, 2014). By making ESD applicable in teaching and learning, teachers and learners can be motivated to come up with various strategies that they can use in order to resolve the current challenges of environmental education. Education for Sustainable Development is essential towards the achievement of a sustainable society and is therefore desirable at all levels of formal education and training as well as in non-formal and informal learning

(Council of European Union, 2010). As a result, the ESD and EE play an important role in this study because teachers realise that it is important to integrate environmental education in teaching and learning to ensure that there is sustainable development.

2.9 THE DEVELOPMENT OF ENVIRONMENTAL EDUCATION INTERNATIONALLY

This section presents the development of EE internationally in the United States of America and Australia about how environmental education is integrated.

2.9.1. The integration of environmental education in United States of America

Environmental education is described as a process that enhances people's knowledge and awareness about the environment and its challenges (UNESCO, 2015). According to Simmons, environmental education has existed for the past twenty years in the United States of America, which is mainly attributed to the way in which American education is decentralized and that schools districts can determine their own curriculum (Simmons, 2012). The integration of environmental education in school curricula has increased in the United States of America through plans and other materials that were published by environmental groups (Simmons, 2012).

In a study that was conducted by Downey (2016) it was urged that the integration of environmental education in the public school system would provide an important opportunity to educate the population on an issue that is covered in confusing and debated science. It could also support learners to understand the fundamental systems of the world around them since environmental education is often presented as an opportunity to explore other instructional strategies that teachers can use to integrate environmental education (Downey, 2016). As a result, it becomes evident that environmental education provides a valuable opportunity to integrate a variety of academic disciplines into a hands-on style of education.

The United States of America introduced a No Child Left Behind Act in 2007, the main aim of the Act was to provide incentives for states to implement environmental education in elementary and secondary school so that it can support the inclusion of environmental based learning and effectively open the door for new experiential teaching and learning methods (No Child Left Behind Act of 2007). The integration of environmental education into a standard curriculum can be complex because No Child Left Behind has tightened up academic schedules throughout the nation (Downey, 2016). Meanwhile, public schools were working on integrating environmental education into the state school system (Carney, 2013).

2.9.2 The integration of environmental education in Australia

Environmental education is defined as the use of varied activities in order to teach individuals of all ages and different backgrounds about the environment so that they can be able to discover their environment and take part in critical thinking and problem solving in order to make informed decisions (National Environmental Education Advisory Council, 2015). The Australian government documents consist of deliberations by the Curriculum Development Centre Committee and study groups on environmental education, two teachers' guides produced by the Centre's Environmental Education Project and the joint Department of Education and Science Curriculum Development Centre booklet on environmental education for schools (Greenall, 1980).

In a study that was conducted by Arcury (1993) it was discovered that several environmental teachers have called for clear statements of principles and objectives of environmental education in order to develop criteria for assessing whether a particular programme or activity is actually addressing the critical objectives of education for the environment. This clearly shows that teachers are indeed motivated towards the development of environmental education as they display a full range of acquiring knowledge, skills, values and social objectives of environmental education to ensure that it is integrated faithfully.

In Australia, education and environmental management are the responsibility of the state, according to the Constitution. Therefore, the UNESCO Implementation Scheme and the Australian Government will be the ones looking at the available opportunities for building capacity and integrating environmental education. This was done to ensure sustainability through promoting and sharing successful Australian initiatives, expertise in education for sustainability, expanding existing Australian Government policies and programs, undertaking gap analysis, evaluation of work to date and inviting national and international partnerships to strengthen and re-orientate policies and programs (Gough, 2010).

These initiatives will grow the Australian Sustainable Schools Initiative as whole school approach to environmental education, contribute to professional development for teachers, embed environmental education integration in curricula, coordinate school-based programs and improve support for environmental education integration (Department of Environment, Water, Heritage and Arts, 2009). The integration of environmental education in Australia provides a good system for developing critical thinking skills and provides topics and problems that cut across the school curriculum (Stevenson et al., 2013). As a result, the researcher is of the viewpoint that the integration of environmental education in Australia does not contribute to teacher and learner development only, but it also enhances the integration of knowledge by teachers which can be studied further.

2.10. THE DEVELOPMENT OF ENVIRONMENTAL EDUCATION IN SOUTHERN AFRICAN COUNTRIES

Environmental education is integrated differently in different countries. Hence, this section presents how neighbouring countries such as Botswana, Namibia, Swaziland and Zimbabwe incorporate environmental education in the curriculum.

2.10.1 The integration of environmental education in Botswana

The formal education system in Botswana consists of four education stages, namely: preschool, primary education, secondary education and higher education (Ministry of Education and Skills Development, 2011). The implementation of environmental education across the curriculum was implemented by the Revised National Policy on Education 1994 (RNPE) (Botswana Government, 1994). This asserts that teachers must integrate environmental education in their teaching and learning. It is believed that the key to successful environmental education integration is through the teacher (Tilbury, 1993). Therefore, it clearly shows that the teacher is one of the important role players in environmental education integration to ensure that environmental education is integrated in their instruction.

In a study that was conducted by Velempini, it was found that teacher's efforts to integrate environmental education in the curriculum were limited in Botswana due to a lack of adequate teaching and learning resources and teacher training programmes regarding how they can integrate environmental education in teaching and learning (Velempini, 2017).

According to Ketlhoilwe, the implementation of environmental Education in Botswana has faced some of the following challenges (Ketlhoilwe, 2003):

- Lack of adequate information from the Curriculum Development Unit of Botswana.
- High number of untrained teachers.
- Lack of teaching and learning resources
- Negative attitude that teachers developed through the implementation of environmental education.
- School environment is not conducive enough for environmental learning.
- Curriculum contains too much theory and it is not easy to integrate environmental education.

A study that was conducted by the Environmental Learning Research Centre discovered that Botswana's school system experienced the following challenges towards the integration and implementation of education for sustainable development (Environmental Learning Research Centre, 2017):

- Education for sustainable development is not a part of teacher education institutions curricula.
- Lack of resources and lack of adequate capacity to create own resources.
- Lack of interest by teachers towards education for sustainable development.
- Education for sustainable development is looked at as a concept that does not form a part of the curriculum
- Lack of support and leadership.

The 1994 Revised Policy on Education advocated how the integration of environmental education across the curriculum took place, mostly in secondary education (Botswana Government, 1994). Therefore, it is important for the Ministry of Education and Skills Development in Botswana to support teachers so that they are able to incorporate environmental education in teaching and learning.

2.10.2 The integration of environmental education in Swaziland

The National Environmental Education Programme (NEEP) of Swaziland defines environmental education as an approach that is essential for long term survival of conservation in the country through the education of the people of Swaziland (NEEP, 2003). The Swaziland National Trust Commission Act no 9 of 1972 came up with NEEP to support and coordinate environmental education in Swaziland in order to enhance deep understanding, application and the evaluation of environmental education in education towards the resolution of environmental problems. This program was implemented to establish a National Council/Steering Committee for environmental education, to provide opportunities for learning the necessary skills needed to fulfil previous objectives and to provide opportunities for individuals to participate actively in environmental education. As a result, the researcher is of the viewpoint that implementing such programs might ensure that the necessity of incorporation environmental education results in a sustainable development for the people of Swaziland.

The incapability to comply with environmental legislation attributed to a lack of environmental knowledge leads to the suggestion of a need for an environmental education programme in the country (Mlipha, 2003). According to the Swaziland Environmental Authority, the policy guidelines have been developed and supported by a series of environmental awareness campaigns and environmental education programmes which targeted predominately schools and citizens at national and local levels (Swaziland Environmental Authority [SEA] 2001). This supported the implementation of environmental education programmes in Swaziland as they felt that they were left out in previous environmental education initiatives. The SEA (2001) and National Environmental Education Policy [NEEP] (2003) identified a number of training programmes required in the integration of environmental education to ensure that there is development, the implementation of environmental awareness campaigns and that there are adequate number of courses available in order to provide teachers with opportunities to enhance policy practice.

2.10.3 The integration of environmental education in Namibia

Namibia's Green Plan was presented at the Rio Earth Summit in 1992. It described environmental education as a process of developing citizens who are environmentally aware and concerned about the environment as a whole and are empowered through knowledge, attitude, motivation, skills and shared decision-making in order to improve the quality of life through the sustainable use of Namibia's resources (Namibia Green Plan, 1992).

Namibia has Ministerial documents that fully support the integration of education about, in and for the environment within the curriculum since environmental education in Namibia is integrated in traditional environmental subjects only (Tubawene, 2009). This shows that these documents were designed to enhance the integration of environment education. However, there are still challenges that hinder the integration of it in the curriculum.

In a study that was conducted by Tubawene, some of the challenges that prevent the integration of environmental education into the Namibian broader curriculum for

secondary school were outlined, which included the lack of inter-departmental collaboration in schools and the lack of sufficient teacher education programmes (Tubawene, 2009). These are some of the challenges that contributed to the failure of environmental education implementation.

According to Loubser and Simalumba (2016) a NEEP was developed in 1999 with the assistance of the Namibia Environmental Education Network and the Ministry of Education (MoE), it emphasised that environmental education should be integrated in all formal education curricula as a cross curricula issue. This clearly shows that there have been a number of studies that were conducted in Namibian schools about environmental education integration. In a study by Kanyimba (2009) it was concluded that environmental education revolves around the integration of knowledge dimensions, but with a lack of integration of values and attitudes, it will result to a lesser extent in the integration of some actions and skill dimensions of the environment. Furthermore, Haindongo found that teachers lacked professional development support to help them in teaching environmental education (Haindongo, 2014). These findings clearly showed that teachers face a lot of limitations when they have to integrate environmental education in teaching and learning.

Namibia implemented the Enviroteach Project in 1998, which is an environmental education program of the Desert Research Foundation of Namibia (DRFN) that aims at establishing environmental education in formal education (Enviroteach, 1998). This project tested the methods and means for integrating environmental education into the Namibian formal education system which focused its activities on resource production and teacher assistance. The Enviroteach project investigated methods in which EE could be best included in the formal education. These solutions included the integration of EE across the curriculum and the inclusion of EE in formal education as a distinct and separate subject.
In 1998, the Enviroteach Project identified some of the challenges that were faced in the implementation process in a cross-curricular manner which include:

- A lack of confidence and experience on the part of the teacher.

- The resistance to change on the part of the teachers, school management, learners and parents.
- A lack of relevant, appropriate and user-friendly resources.
- A lack of support from school management who in many instances do not understand the new methodology being communicated through educational reform.

Therefore, this project clearly showed that the integration of EE in Namibia not only focused on the curriculum but promoting the importance of EE by equipping teachers and learners with skills, knowledge and challenges involved in sustainable education as well.

The Enviroteach project (1998) managed to provide EE materials and assisted teachers in how to use these resourceful materials. It also managed to introduce EE as a cross-curriculum theme within the Broad Curriculum and contributed to the reform process by promoting cross-curricula and learner-centred approaches to teaching and learning.

2.10.4 The integration of environmental education Zimbabwe

Environmental education and sustainable development in Zimbabwe has contributed towards the level of debate and research at global, national and local levels (Fien, 1993). The Zimbabwean education system reviewed the curriculum which was guided by a National Curriculum Review Framework and ensured that the development of EE in Zimbabwe led to all primary school syllabi being reviewed. This clearly showed that the education system of Zimbabwe accommodated skills such as communication, problem-solving, creative thinking and innovation. In a study that was conducted by Muchinguri-Kashiri, it was stated that children should be provided with essential knowledge and skills on the environment in order for them to be able to deal with any environmental challenges that they may encounter so that they are aware of strategies that they can use to sustain the environment (Muchinguri-Kashiri, 2018).

As a result, environmental education in Zimbabwe can be traced back to the 1940's during the colonial times, where it was provided through conservation education that occurred in schools and colleges (Chikunda, 2007). In 1941, the Natural Resources Board (NRB), which was responsible for the Ministry of Agriculture and Land, was established in order to play a role in the promulgation of environmental education (Whitlow, 1988). The Zimbabwean country did not have a policy on environmental education that was written during the colonial era (Mapira, 2014). This proved that the all of the various governments that provided environmental education individually were ineffective and they were abounded through the transmission of environmental Management Act 20-27 of 2002. The Environmental Management Act 20-27 of 2002 focused on protection and sustainable management of natural resources, implementation of environmental management agency and funds, and the prevention of environmental degradation and pollution. This led to the implementation of the Environmental Management Agency (EMA) which played a role in the process of providing environmental education at a local and national level.

The Zimbabwean educational system has encountered challenges during the process of incorporating environmental education (Mapira, 2014). The integration of environmental education in Zimbabwe focused more on providing facts about the environment rather than for the environment (Fien, 1993). The Zimbabweans had lacked sufficient knowledge about environmental education, education for sustainable development and sustainable development (Mapira, 2014). Environmental education programmes in Zimbabwe did not infuse a sense of being responsible towards the environment amongst its citizens as there were high levels of environmental crimes in terms of pollution, degradation, deforestation and the over-use of other wildlife resources (Chikunda, 2007).

According to Mapira (2014) the Zimbabwean government developed programmes to improve the country's environmental education these programmes suggested that:

- Environmental education should be priority in all educational systems of Zimbabwe whereby the state can also take account of the environmental challenges that the country experiences.
- More educational programmes must be introduced in the country so that they can develop environmental sensitivity which is necessary towards the programme of environmental education.

2.11 THE DEVELOPMENT OF ENVIRONMENTAL EDUCATION IN SOUTH AFRICA

The contemporary forms of environmental education first reached South Africa in the mid 1970's (Belgrade Charter, 1975 & Tbilisi Principles, 1977). However, with the pre-1994 developments in South Africa, the integration of environmental education has not been a smooth process as it has raised numerous debates. In 1980 the concept of environmental education was confused with outdoor education which focused on outdoor activities rather than the study of and building respect for the environment. These theoretical developments and perspectives led to an increasing interest in international developments in environmental education. As part of the reaction to this, an international conference on environmental education was held in Pretoria in 1980, while the first international conference on environmental education in South Africa took place in 1982 at Treverton College, Mooi River in Natal (Irwin, 1990).

As environmental education started to develop in South Africa, there were successful environmental education initiatives in some of the homelands of pre-1994 South Africa. A White Paper on Environmental Education was tabled in the South African Parliament and the Department of Environmental Affairs was given credit, which assisted in the creation of environmental education courses and programs at the tertiary level, especially for teachers and decision-makers were developed in the North West University (Irwin, 1992).

With all of these developments, the integration of environmental education in South Africa has become an integral part in all learning areas whereby it is now integrated in school subjects in the formal curriculum. Currently, every subject that is taught in

South Africa has a particular environmental focus that is included within it. Such developments provide opportunities to conduct studies about environmental education. There was a study that was conducted by Motshegoa which focused on the policy and practice of environmental education in schools that are in South Africa (Motshegoa, 2006). Another study was conducted by Mokhele which focused on the opportunities that are there to learn about environmental education (Mokhele, 2007). A recent study was conducted by Msezane which focused on exploration of the impact of environmental education innovations on students in sustaining land resources (Msezane, 2014). As a result, this clearly shows that environmental education in South Africa is developing.

2.12. SOUTH AFRICAN SCHOOL SYSTEM

The South African education system is made up of two national departments, the Department of Basic Education (DBE), which is responsible for primary and secondary school, and the Department of Higher Education and Training (DHET), which is mainly responsible for vocational training and tertiary education. The DBE focus more on public schools, independent schools, and Early Childhood Development Centres (ECD) as well as schools for special needs. The DBE consists of four phases, namely: the Foundation phase (Grades R-3), Intermediate phase (Grades 4-6), senior phase (Grades 5-7) and Further Education and Training (FET) phase (Grades 10-12). Public schools are schools that are owned by the state and independent schools are schools that are not owned by the state.

The DHET is mainly concerned with further education and training colleges (FET), the Adult Basic Education and Training centers (ABET) and Higher Education (HE) institutions. The basic education system in South Africa starts from Grade R to 12. The South African school system does not have grade 13.

Teachers in the South African school system are allocated as per learner ratios. According to the DBE (2010) statistics report one teacher is provided for 30 learners on average and the ratio of learner per teacher is almost the same in all nine provinces in South Africa. South African schools receive funds from the government

for all necessary operational costs which covers books, educational materials, salaries, administration costs, maintenance and extra-curricular activities. Parents may apply to the school for a full or partial reduction of school fees if they cannot afford it and many schools offer financial assistance to a small number of learners. South African schools receive a government grant per child according to the quintile of the school. The school system of South Africa is made up of five quintiles; quintile one, two and three are the poorest schools which may apply for classification as a "No Fee" paying school, whereas schools in quintile four and five are regarded as richer schools. This study was conducted in a senior phase school which falls under the third quintile.

2.12 INTEGRATION OF ENVIRONMENTAL EDUCATION IN SENIOR PHASE SCHOOLS IN SOUTH AFRICA

Curriculum development is important as it outlines the learning outcomes, standards and core competencies that one must have since teachers play an important role in implementing, assessing, developing and modifying the curriculum (Glenn, 2018). This section presents South African educational policies as stipulated by the Department of Education on environmental education which include Curriculum 2005, the National Curriculum Statement, the Revised National Curriculum Statement and the Curriculum Assessment Policy Statement.

2.13.1 Curriculum 2005

Curriculum 2005 is the South African version of outcomes-based education, and marks a new era in South African education in which all learners are promised high-quality education that will fully prepare them for life. Curriculum 2005 defines environmental education as a cross-curricular phase organiser which requires teachers in all learning areas to consider an environmental focus (DBE, 2005). These requirements led to the development of a National Curriculum Statement for General Education and Training which concluded that a need to re-consider the focus of environmental education work in curriculum policy development is prevalent.

2.13.2 National curriculum statement (NCS)

National curriculum statement Grade R-12 represents a policy statement for learning and teaching in South African schools.

The National Curriculum Statement Grade R-12 serves the purpose of:

- Equipping learners with knowledge, skills and values that are necessary for self-fulfilment and meaningful participation in society irrespective of their socio-economic background.
- National curriculum statement (NCS) promotes environmental education by ensuring that transformation of education caters to the purposes of learning, ensuring functional educational institutions and educational buildings.
- It ensures that all of the values and attitudes contained in the NCS will be continuously reinforced by schools to ensure that there is a lifelong learning process.
- It also ensures that school development as a whole promotes sustainability in environmental education in such a way that they adapt a holistic approach that considers the environment and other stakeholders. NCS also provides educators with the norms and standards needed to ensure that they fulfil their responsibilities of becoming leaders.

The impact of the National Curriculum Statement on the implementation of Environmental Education is that it provides teachers with norms and standards that they need in order to be proponents of change. It assists in the reinforcement of values and attitudes that the school's practices have. It will also help to acknowledge the purpose of learning and educational institutions as well as to ensure sustainability.

2.13.3 Revised national curriculum statement grades R-9 (RNCS)

According to the DBE (2002) the Revised National Curriculum Statement is a policy statement that sets high expectations of what South African learners can achieve and is aimed at the development of high levels of skills and knowledge.
The RNCS focuses on curriculum requirements at the various levels and phases and gives a clear description of the kind of learner that is expected at the end of General Education and Training (GET).

The following are the principles of RNCS:

- Social justice, a healthy environment, human rights and inclusivity.
- Integration to ensure that learners experience the learning areas as related by making links within and across learning areas as it supports and expand learners' opportunities to develop skills, attitudes, values and acquire knowledge across the curriculum.

Therefore, in this study it is important to acknowledge that environmental education is integrated across all subjects.

2.13.4 Curriculum assessment policy statement (CAPS)

A National Curriculum and Assessment Policy statement is a single, comprehensive policy document that has replaced the learning area, subjects and learning programme guidelines for all the subjects that are listed in the National Curriculum Statement Grades R-12. The National Curriculum Statement Grades R-12 contains the following principles which are incorporates in all CAPS documents:

- Active and critical learning: encouraging an active and critical approach to learning rather than rote and uncritical learning of given truths.
- Human rights, inclusivity, environmental and social justice: infusing the principles and practices of social and environmental justice and human rights as defined in the Constitution of the Republic of South Africa.
- Credibility, quality and efficiency: providing an education that is comparable in quality, breadth and depth to those of other countries.

These principles serve as guiding principles towards the integration of environmental education across all subjects as they ensure that science and technology is used effectively and critically through teaching and encouraging responsibility towards the environment and the health of others.

2.14. TEACHING STRATEGIES THAT ARE USED IN TEACHING AND LEARNING

Teaching strategies are methods that are used by teachers to assist learners to learn and acquire knowledge about certain subject content. In a study that was conducted by Freiburg, he viewed teaching strategies as an approach used as a plan of action for teaching and learning activities in order to ensure that teachers and learners achieve their desired outcome (Freiburg, 1996). In this study, teaching strategies are viewed as instructional strategies that consist of a structure, techniques and guidelines that teachers can use during the process of teaching. As a result, the researcher is of the viewpoint that using a variety of instructional strategies in the teaching and learning process plays an important role as it not only benefits teachers, but it also accommodates different learners along with their different learning styles.

In this study, teaching strategies such as discussion method, textbook method, excursion, lecture method and interactive method will be reviewed taking into consideration the advantages and disadvantages that they have. During training to become a teacher, the researcher observed that most teachers used the above-mentioned teaching strategies when they taught. Hence, the researcher became interested in finding out whether these instructional strategies allowed or hindered the integration of environmental education and to look at other teaching strategies that teachers use when integrating environmental learning, if they integrate environmental education at all.

DISCUSSION METHOD

According to Cashin, the discussion method is referred to as an imperative teaching method in all disciplines of teaching and learning with the aim of assisting learners

to process information rather than receiving it (Cashin, 2011). In this study, it refers to an interactive approach between the teacher and the learner with the aim of enhancing the learner's problem-solving skills, creative thinking skills and understanding.

In a study that was conducted by Zvavanhu (2010) the advantages and disadvantages of discussion method were outlined as stipulated below.

Advantages of discussion method:

- It enhances skills that allow an individual to develop deeper understanding and communication skills
- It assists in enhancing listening, speaking and leadership skills.
- It provides an opportunity to learn from one another through teamwork and active participation.
- It promotes tolerance and supports learners to understand that there are many aspects to any topic.

Disadvantages of discussion method:

- It is time-consuming and some teachers neglect lesson preparations and take advantage of this method.
- Most teachers do not want to use this method during instruction as they feel that they will lose control of their class.
- Learners may become disorganised and noisy.
- It leads to less effectiveness of teaching and learning.

As a result, the researcher is of the viewpoint that if teachers use discussion method to integrate environmental education, learners will be more encouraged to be responsible when they interact with their peers as they are engaged in active participation. In this study, teachers ensured that when they used this method, they communicated instructions clearly and effectively in the learning environment where teaching and learning took place.

TEXTBOOK METHOD

In this study, textbook method is a teaching strategy and a teaching aid that is used by teachers during instruction. Textbooks play an important role in the teaching and learning process. Textbooks can be the most useful teaching resource for a teacher as a course designer, and learners as those who obtain information from it (Gak, 2011). Textbooks are used as a source of information for a formal study of a particular subject and what one teacher considers as a disadvantage, another one may consider as an advantage (Graves, 2000). As a result, the use of textbook method in this study was beneficial in some of the lessons that were presented by teachers as they were able to relate environmental education to real life situations.

According to Graves (2000) and Basturkmen (2010) the use of textbook method has the following advantages and disadvantages:

- It provides teachers with an opportunity to assess their learners' performance since some textbooks include tests, evaluation tools and self-assessment.
- It contains activities, readings and visuals that save teachers time in finding materials that are relevant to the content.
- Textbooks contain supporting materials such as teacher's guides, videos and worksheets.
- It provides a syllabus for the subject content that needs to be covered and in what order.

The following are the disadvantages of the textbook method:

- The content of the textbook method may not be at the right level for learners
- The textbook method does not take learners' pre-existing knowledge into consideration.
- Some teachers only use text book and no other teaching resources.
- Some textbooks contain lot of outdate information.

EXCURSION METHOD

In this study, excursion method refers to a trip strategy. According to Shillibeer (2012) it is a visit to a place that is outside the classroom environment which is used to achieve a certain outcome that cannot be achieved in a classroom environment. This method was not evident in the lessons that were presented by the teachers and it could have been interesting to see how environmental education could be integrated through excursions. Furthermore, Shillibeer (2012) outlined the advantages and the disadvantages of the excursion method.

Advantages of excursion method:

- It enhances the curriculum as they are rich in educational possibilities that learners can learn from actual, personal experiences.
- It increases learners' and teachers' social interaction as it provides an opportunity to engage with parents, learners and teachers in the instructional program.
- It assists learners to appreciate the relevance of what they learn in a classroom environment.
- It supports learners to be aware of learning activities in everyday life and they are able to reflect upon them in real life situations.

Disadvantages of excursions method:

- There are limited resources since some schools cannot provide teachers with materials that are relevant for the trip due to a shortage of resources.
- There are high medical risks involved.
- There is a lack of support from school administrations for trips.
- It is viewed as time-consuming due to difficulties that they experience during the preparations and taking into consideration the school timetable.

LECTURE METHOD

Lecture method is a one-way channel of communication whereby a teacher becomes an authoritative figure. Learners' involvement in this method is minimal as they just listen and sometimes take down notes that are relevant to the content (Farroq, 2012). This method was not evident in the lessons that were presented by teachers when the focus was to find out about the instructional strategies that teachers used to integrate environmental education.

According to Paris (2014) the lecture method has the following advantages:

Advantages of lecture method:

- It makes the teaching and learning process effortless for the teacher since learners are required to pay attention and take relevant notes.
- Teachers have full control based on how they want to shape the entire lesson since they are the authoritative figure.

According to Bonwell (1996) the following are the disadvantages of lecture method:

- It does not provide teachers with enough feedback about learners' learning.
- It is not suitable for teaching a high order of thinking whereby learners have to analyse, evaluate or apply knowledge.
- There is no mechanism available to ensure that learners are engaged intellectually with the learning material.
- Learners forget information easily when they are passive.

INTERACTIVE METHOD

In this study, an interactive teaching method is a method that involves a teacher and learner. It encourages learners to participate in teaching and learning and it makes use of questions to enhance discussion and give learners a hands-on experience in order to solve problems effectively (Yakovleva, 2014). This method was evident in the lessons that were presented by teachers. It enhanced the integration of environmental education. However, environmental education was not integrated effectively due to challenges that teachers experienced.

According to Concordia University-Portland, the following are advantages of an interactive teaching method:

- There is flexibility in teaching and learning due to the application of training methods that include two-way communication that allows individuals to make adjustments on the approaches that they use.
- It enhances the teaching and learning process.
- Learners are motivated to study as they are fully engaged in the instruction.
- Teachers are able to assess how well their learners master the given subject material.

In a study that was conducted by Moraru (2014) the following disadvantages of an interactive teaching method were outlined as follows:

- Teachers find it difficult to tell whether learners are discussing academic related content or something that is irrelevant.
- There are high chances of conflict emerging amongst learners.
- A group of learners with mixed abilities and lower achieving learners tend to be more resistant and do not focus on the given task.
- It can leads to learners feeling responsible for each other's learning apart from themselves.

2.15. BENEFITS OF ENVIRONMENTAL EDUCATION INTEGRATION BY TEACHERS

Environmental education integration is important as it provides important opportunities for learners to become engaged in real world issues that go beyond the classroom walls (Campbell, 2014). Below are environmental education benefits for teachers:

1. Creating enthusiastic students
2. Fostering innovative teacher leaders
3. Addressing academic standards

According to the National Environmental Education Act of 1990, environmental education is more than merely gathering information about the environment as it has the following benefits which are to:

1. increase public awareness and knowledge of environmental issues
2. provide facts and opinions about environmental issues
3. teach individuals about critical thinking
4. enhance individuals' problem-solving and decision-making skills

According to the National Environmental Education Foundation's Health & Environment program, the following are the benefits of EE integration:

1. EE instructional strategies help to foster leadership skills
2. EE makes other school subjects rich and relevant
3. EE schools demonstrate better academic performance across the curriculum

As a result, the researcher of the viewpoint that if environmental education is integrated effectively in the teaching and learning process, these benefits can allow teachers to stimulate academic and social growth of the learners in a manner that they are able to promote conservation of the natural environment to ensure that there is sustainable development and education.

2.16 THE CONCEPTUAL FRAMEWORK

A conceptual framework is the system of concepts, assumptions, expectations, beliefs and theories that support and inform research (Maxwell, 1996). It is an argument that the concepts chosen for investigation and any anticipated relationships among them will be appropriate and useful given the research problem under investigation (Lester, 2005). A conceptual framework provides a scheme for selecting and prioritising variables that are of interest to the researcher (Berger & Patchener, 1988).

This study focuses on teachers' knowledge about environment, integration, environmental education and the integration of environmental education. The instructional strategies as well as challenges and opportunities will be considered. According to Ward et al, an environment refers to the surroundings and its' influence on a particular interest (Ward et al. 2013). It follows that in this study, environment refers to the natural surroundings because it accommodates and influences all living and non-living organisms. Integration is a process of combining things (Rouse, 2018). Thus, in this study, integration refers to an action of combining two or more things because the focus in this study is to explore how environmental education has been integrated. As a result, the combination in this context, which is integration, takes place between environmental education and the process of teaching and learning.

According to UNESCO (2014) environmental education refers to organised efforts that are needed in order to teach about the functions of natural environments and how human beings manage ecosystems as well as their behaviour in order to live sustainably. Environmental education is a process that involves the relationship between human beings, the artificial and natural environment, which includes pollution, population, sustainability and the relationship between rural and urban as well as the entire human environment (Legood et al. 2016). Therefore, in this study, environmental education is a process that teachers utilise towards constructing knowledge, skills, values and attitudes, because these aspects are needed to enhance environmental awareness in teaching and learning in order to cultivate responsible environmental citizens that are able to take actions towards environmental protection and sustainability.

The integration of environmental education is the process of creating awareness and developing an understanding about environmental issues in teaching and learning (Downey, 2016). In this study, the integration of environmental education is when the teacher considers the school surroundings, the curriculum of the subject and environmental issues because they provide a framework to integrate the lesson

content with environmental education in teaching and learning. Instructional strategies refers to a comprehensive plan of action for the teaching and learning process in order to achieve the desired outcomes of the lesson (Rossouw, 2012). Instructional strategies are learning approaches that are used by teachers to assist learners to develop better understanding of what is being taught (Persaud, 2018). In this study, instructional strategies are the teaching methods that are used by teachers because they play an important role towards enhancing learner engagement as they also encourage understanding towards the content that is being taught. A challenge is a situation that is considered as threatening (Fontanez, 2012). However, in this study, a challenge is interpreted as problems or unfavourable situations because they can impede or prevent anything from happening. Opportunities are situations that are contributing to the occurrence of task performance (Emeasoba, 2018). In this study, an opportunity entails conditions that are considered to be favourable because they result in situations that can offer advantages.

2.17 SUMMARY

Chapter 2 has reviewed the literature conducted in relation to the study. It analysed the historical developments of environmental education, it described environmental education, the perceptions of environmental education and the failures of environmental education. It explained environmental learning, sustainable development and education for sustainable development. It analysed the development and the incorporation of environmental education internationally in the United States of America and Australia. It analysed the development and incorporation of environmental education by Southern African countries such as Botswana, Namibia, Swaziland and Zimbabwe. It also analysed the development of environmental education in South Africa. It looked at the South African school system, the integration of environmental education in senior phase schools in South Africa, the teaching strategies that are used in teaching and learning as well as the benefits of integrating environmental education. Then, this chapter concluded with

the conceptual framework. Chapter three follows with the research methodology and design underpinning the study.

CHAPTER 3
RESEARCH METHODOLOGY AND DESIGN

3.1 INTRODUCTION

The previous chapter entailed the literature reviewed for this study, while this chapter provides an overview of the methods and the research design of the study. It outlines procedures used to collect data and the research paradigm. There is also a discussion on how data will be analysed and interpreted. The main aim of this research is to explore how senior phase teachers integrate environmental education.

3.2 RESEARCH PARADIGM

Research paradigms are a set of common beliefs and agreements that are shared amongst scientists about how problems should be understood and addressed (McMillan & Schumacher, 2014). These paradigms are very important to researchers as they serve as a guideline on which research methods can be used and the research questions that must be addressed in a research study. In every research study the researcher must be able to clearly and logically decide which is the most appropriate research paradigm that they will use in their research study in order to achieve the maximum outcome. Interpretivists are those who believe that there is no single correct method to knowledge but rather that there are multiple realities (Maree, 2007). Furthermore, Creswell emphasises that in interpretative tradition there are no correct or incorrect theories that are used (Creswell, 2007).

In this study, an interpretative research paradigm was used as it best aligned to the qualitative research method. The interpretative research paradigm assumes that people construct and develop their own subjective and inter-subjective meanings as they interact with the world around them (Packer, 2011). Therefore, having used this research paradigm the researcher was able to interpret and understand teacher's knowledge in relation to environmental, instructional strategies that they used to integrate environmental education as well as the challenges and opportunities that they experienced when they had to integrate environmental education.

Therefore, all data that was collected in this study was interpreted with the basis on the literature reviewed and personal experiences so that meaning could be drawn out of all of the information that was gathered in this study by drawing judgement inferences (McMillan & Schumacher, 2014). The interpretation in this research was paramount to instructional strategies that the participants used to integrate environmental education. Hence, the researcher used the interpretation to find out how the participants make sense of the social world in their natural setting through the means of daily routines.

3.3. RESEARCH METHODOLOGY

Research methodology refers to the conditions and processes for collecting and analysing data for a specific purpose, and is referred to as a systematic way that is used to solve problems (McMillan & Schumacher, 2014). Research methodology is referred to as actions that need to be taken in order to explore a research problem and the rationale for the application of specific procedures (Kallet, 2004). It is used to identify, select, process and analyse data towards understanding the problem in order to assess the validity and reliability of the research study (Kallet, 2004).

There are research methods in educational research such as quantitative research, qualitative research and mixed method research (McMillan & Schumacher, 2014). This study applied the qualitative method as it is considered to be the best method for researching how and why questions of human experience (Hammarberg, 2016). Hence, the aim of the study is to find out how teachers integrate environmental education in the teaching and learning process. Furthermore, the qualitative research method is viewed as a method of observation that is used to gather non-numerical data (Babbie, 2014). Therefore, in this study data was collected through interviews and lesson observations.

Qualitative research method enabled the researcher to access thoughts, opinions and beliefs of the participants so that a deeper understanding on how teachers integrate environmental education in teaching and learning can be developed (Sutton, 2015).

3.4. RESEARCH DESIGN

A research design is a design that positions the researcher in the empirical world and connects the research questions to the data and findings of the study (Wengraf, 2002). A research design is used to plan the research methods properly and to make sure that the elements of the research work together properly to fit the research study.

Research design is referred to as a basic plan for a piece of research, which includes four main ideas that are the strategy, the conceptual framework, the questions that shape the study and the tools and procedures used for collecting and analysing empirical materials (Punch, 2013). Therefore, it was important for the researcher to have a proper plan of action that could be implemented in order to decide how the research study would be communicated and executed. As a result, the study adopted a case study design. The nature of the research study required the researcher to have direct contact with the teachers in the school so that data that answered all of the research questions could be collected.

3.4.1 Case study design

Case studies focus on broad contextual analysis for a limited number of events or conditions as well as their relationship (McMillan & Schumacher, 2014). A case study is an in-depth study of a bounded system that includes an activity, process, event or individuals based on wide data collection (Creswell, 2007). This research adopted a case study design because the study required the researcher to have direct and close interactions with teachers since the strategies that they used to integrate environmental education needed to be understood from teacher's point of view and experience. There were three Grade 7 teachers who participated in this study and as such this was a multiple case study. For every teacher that was selected, they were considered as a case. With each teacher being a case, the researcher studied each case within its natural context and challenged theoretical assumptions that were raised on the basis of conducted environmental education research (Yin, 1989). This research study is not a comparative study, therefore the

three cases are not compared to one another, but inferences can be drawn from the data that was collected from them.

3.5 RESEARCH CONTEXT

This section presents the setting of the research and the sampling process. As part of the sampling process, this section also discusses the cases as well as the criteria and the process that was used to select them.

3.5.1 Research setting

This study was conducted in the Republic of South Africa. The government consists of two national education departments, which is the Department of Basic Education (DBE) and the Department of Higher Education and Training (DHET). There are nine provinces in this country which are made up of their own Provincial Departments of Education (PDE). Every PDE is made up of districts, and districts are made up of circuits. The Mpumalanga Province consist of 3 districts, namely the Ehlanzeni district, Gert Sibande district and Nkangala district. This study was conducted in the Mpumalanga Province, Nkangala district in one school under the Tweefontein South Circuit. The researcher chose a school under this circuit as it is located five kilometres away from their place of work. The school is a senior phase school which caters for learners from Grade 7 to Grade 9. The school comprises of eight teachers, 240 learners and one school principal.

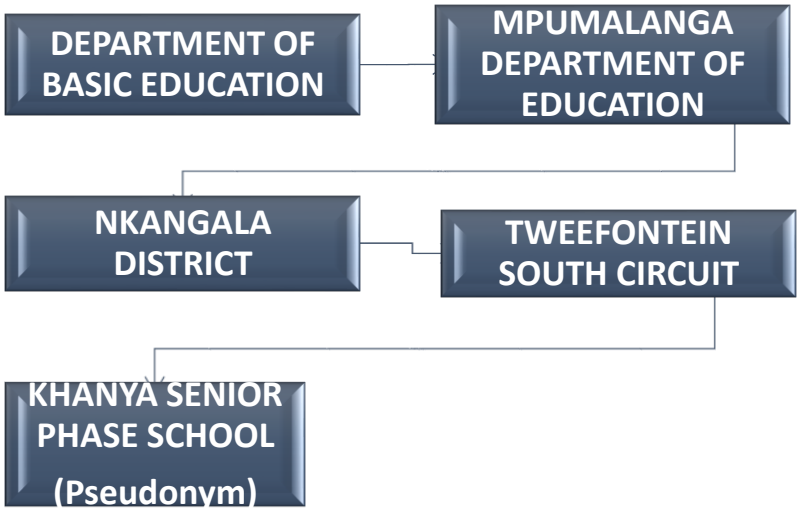

Figure 2. Research setting for this study:

3.5.2 Sampling process

This section outlines the criteria used to select the sample. It also discusses the process that was followed to select cases.

A. The criteria

The selection process of the sample was based on the following criteria:

- Teachers must have been working in the present school for more than two years. This is to ensure that teachers are familiar with the subject content that they have taught previously as well as the challenges that they have experienced.
- They must be qualified teachers and trained to teach the subjects that they are currently teaching. According to the DBE (2018) a qualified teacher must have a four-year Bachelor of Education degree (B.Ed), a one-year Post-graduate Certificate in Education (PGCE) or a three-or-four year degree that will be proceeded by a PGCE, which is a one year qualification to train graduates who wish to become school teachers (University of Cape Town, 2019). The teachers must be registered with South African Council for Educators (SACE) which is a professional body aimed at enhancing the status of the teaching profession through appropriate registration, management of professional development and the infusion of a code of ethics for all teachers
- Each teacher must be teaching at least one of the grade 7 subjects.

B. THE PROCESS OF CHOOSING CASES

When choosing cases for this study, the researcher started by choosing a setting, which in this context it was a school. Permission was requested from the school principal to conduct the study. Meetings with grade 7 teachers in the school were organised so that they could be informed about the research

study. Teachers were given the selection criteria in order to sample participants so that they were aware of the nature of the study and what was expected from them. Teachers who met the requirements of the selection criteria were requested to participate in the study, voluntarily so. Consent letters were given to the participants, and thus three teachers who taught Life Orientation, Natural Science and Technology participated in this study with one being a pilot study. The researcher chose three teachers to participate in this study because in a qualitative research method there are no rules that can be applied to determine the sample size as it depends on what the researcher wants to know and as well as the amount of time available (McMillan & Schumacher, 2014).

3.5. DATA COLLECTION TECHNIQUE

Data collection is a process of measuring and gathering data which allows the researcher to evaluate the outcomes of the proposed research, answer research questions and test hypotheses (McMillan & Schumacher, 2014). Once the data is collected by the researcher, they are able to interpret and draw conclusions of the findings. In this research qualitative data was collected through interviews and lesson observations.

3.6.1. Interviews

In this research study the data was collected by means of interviews since interviewing participant's functions as the primary data collection approach and is a natural outgrowth of observation strategies (McMillan & Schumacher, 2014). Interviews involve the interviewer who initiates the process of the conversation and asks questions, then the interviewee answers the questions that were asked by the interviewer (Easwaramoorthy & Zarinpoush, 2006). The purpose of conducting interviews is to develop a deeper understanding concerning the meaning of what the interviewees say (Kvale, 1996).

In this study, the researcher coordinated face-to-face interviews and asked questions in the interview process whilst the participants, who are teachers, served as interviewees. Conducting face-to-face interviews enabled the researcher to have control over the interview, capture verbal and non-verbal cues, keep the interviewee focused and ensure accurate screening (DeFranzo, 2014). The benefits of conducting face-to-face interviews include providing an opportunity to gain a deeper understanding, building up a faster assessment process and enabling comprehensive data collection (Meier, 2018). Collecting data through interviews was appropriate in this study as the researcher needed to collect in-depth information on participant opinions, thoughts and experiences about how they integrate environmental education in teaching and learning (Gubrium & Holstein, 2001).

Semi-structured interviews were used in the process of data collection whereby more open questions were asked which allowed discussion with the participants rather than straightforward questions and answer (Doyle, 2019). Semi-structured interviews provide a clear guideline for interviews which can provide comparable, reliable and qualitative data (Bernard, 1988). Moreover, structured interviews are often proceeded by observations in order to enable the researcher to gain a deeper understanding of the topic of interest necessary for developing relevant and meaningful semi-structured interviews (Bernard, 1988).

In the course of interviews, the researcher ensured that open questions were asked that were followed by further probing and clarification. This provided an opportunity to obtain an amount of data and to verify what the participants said (Nieuwenhuis, 2016). The main aim of conducting interviews in this study was to ensure that the researcher (interviewer) was able to see the world through the eyes of the selected participants (teachers). In order to ensure that all of the necessary information was collected and analysed accordingly in order to see how they relate to social reality, the study took place in one selected senior phase school in the Nkangala District under the Tweefontein South Circuit.

Only three teachers who teach Life Orientation, Natural Science and Technology in Grade 7 were interviewed in order to find out how they integrated environmental education in their teaching and learning. Pre-interviews were conducted before the lesson observations and post-interviews were conducted after the lesson observations. The main purpose of conducting pre-interviews was to allow the researcher to gather more information about the participant's prior knowledge of environmental education integration (Doyle, 2019). After pre-interviews were conducted, lesson observations took place as they served as a guideline to conduct post-interviews which were used to follow up to what the participants said during the pre-interview and what was observed during lesson observations.

The interviews were conducted during working hours between 08:00am and 15:00pm. The participants informed the researcher of their availability for interviews to avoid interrupting their day-to-day activities. The face-to-face interviews were conducted for 15 to 30 minutes while factoring in the ethical considerations of the research participants. The interviews were conducted in an area that was private and participants were allowed to select the appropriate environment in the school premises to conduct the interviews. An audio recorder was used to record the interviews with the consent of the participants to ensure that all data that was collected was not misinterpreted during the process of data analysis.

3.6.2 Observations

Observations refer to the recordings of the behaviour sample whereby the researcher relies on their powers of observation based on what they have witnessed rather than communicating with people in order to obtain information on what they say or think (Sheroz, 2013). However, McMillan and Schumacher (2014) describe observations as an approach that is used to collect data by watching people, events or noting physical characteristics in their natural setting. In this study, observations were conducted to hear and see anything that occurs naturally in the research setting. The researcher was a non-participant observer during the data collection process and the participants were aware that they were being observed.

As a non-participant observer, the main focus was to simply observe the activities that were conducted by three teachers without taking part in them (Sheroz, 2013). During this observation process, the researcher was exposed to different learning environments such as the classroom and outdoor learning during lesson observations. The researcher observed all of the lessons that were conducted during the teaching and learning process in a manner that the lesson in progress was not disrupted and that all data collected was not misinterpreted.

Classroom and outdoor observations were conducted during the teaching and learning process. This provided an opportunity to collect data as it happened and to explore how teachers integrated environmental education in teaching and learning. Three teachers were observed and an audio recorder was used to collect data during lesson observations in order to meet the ethical protocol of ensuring accuracy. Once observations were completed, they were transcribed and analysed.

3.6.2 Data collection process

The researcher requested a meeting with the school principal where the research was conducted so that the process of data collection could be elaborated upon. The principal was assured that the interviews and lesson observations were not going to interrupt any teaching and learning activities of the school. Interviews and lesson observations were conducted when the teachers had a free period or during lunch considering what they preferred. Timetables were requested from all three participants in order to schedule lesson observations and interviews with them. The process of data collection commenced by conducting pre-observation interviews which took place before the lesson observations, followed by lesson observations and concluding with post-observation interviews that were conducted after the lesson observations.

3.7 DATA CODING, ANALYSIS AND INTERPRETATION

In this study, data was presented through the development of categories and themes. Themes are patterns across sets of data that are important to the narrative

of a phenomenon and are connected to a specific research question (McMillan & Schumacher, 2014). Category refers to a word or phrase that is used to describe a group of codes which encompass a single idea. A typology approach was utilised to analyse data based on the research questions, themes, conceptual framework, literature review and the personal experience of the researcher, which were aligned to ensure that data is organised accordingly and to enhance the identification of analysis patterns (Hatch, 2002). This approach was utilised in order to develop a range and categories of data when interpreting and analysing the data that was collected.

Each case was analysed and interpreted as a single case. The transcribing process was implemented using the analytical framework was as follows: The researcher transcribed all audio interviews and lesson observations that were conducted word for word. Errors related to grammar were not corrected to ensure that all data that was collected was interpreted accordingly and does not lose its original meaning. When the participants that responded in African languages other than English, what was said was translated into English. The researcher ensured that attention was paid to the translation process to ensure that nothing was changed. This was accomplished by asking the participants if the translations that were made represented what was said in their own language. After the transcribing procedure, the document was scrutinised thoroughly while listening the audio recorder to ensure that what was included in the document represents what was said in the audio. Three lessons were observed per teacher and carefully transcribed in 10-minute intervals throughout the lesson observations to ensure that the data collected assisted with the analysis of findings. The notes from the lesson observation schedule were typed for analysis, transcripts and notes were read thoroughly to make sense of all data collected from the participants.

Data was coded by reading all transcripts constantly one by one per interview and lesson observation schedule. Topics were turned into categories whereby data belonging to each category was prepared for analysis. Coding was done on topics that are related to the main research question as well as sub-questions. The

researcher used the coding process to develop a description of themes whereby themes were reduced. During this process, the conceptual framework and literature was consulted in order to be in line with the research questions.

The analysis and interpretation process that was adapted by the study is shown below:

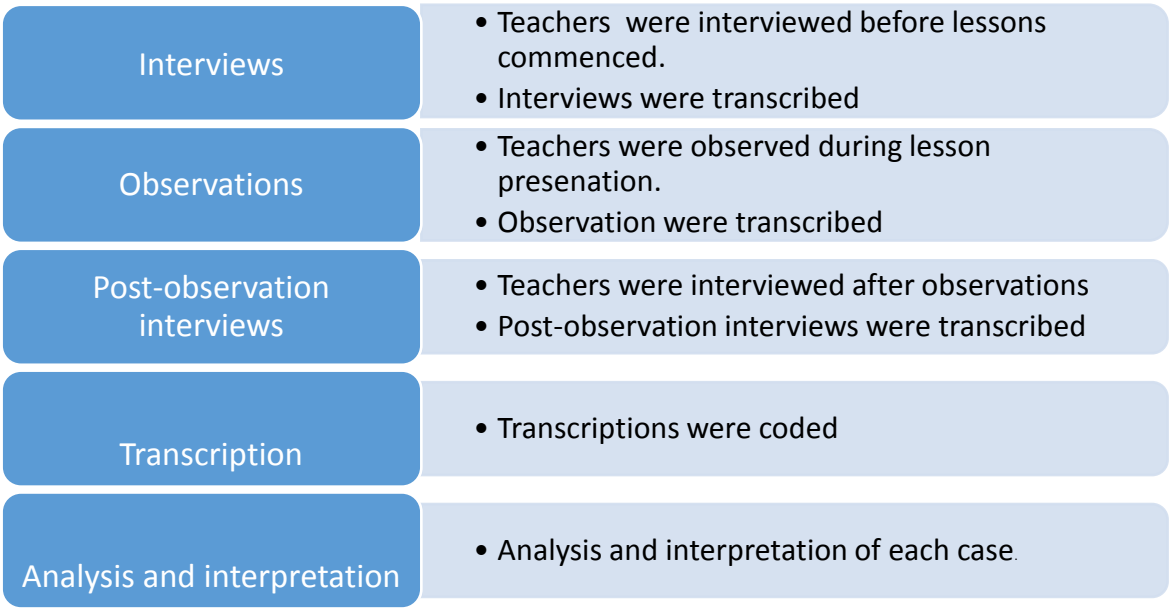

Figure 3: Analysis and interpretation process

The data analysis scheme was developed from the conceptual framework.

3.7 DATA PRESENTATIONS AND FINDINGS

As inductive analysis was implored in this study, themes were used to organise data presentation and the findings. Direct quotations were used to support the researchers' inferences. Using quotations when presenting data serves as an evidence for interpretation as well as conclusion (Anderson, 2010).

3.8. RIGOUR OF THE STUDY

To ensure rigour the following were realised for this study; credibility and trustworthiness, validity, triangulation and the piloting study.

3.8.1 Credibility and trustworthiness

Establishing credibility and trustworthiness in a research study serves as the most significant part in qualitative research. Trustworthiness refers to a demonstration that the evidence for the findings reported is sound and an argument made based on the findings is strong (LaBanca, 2010). The aim of trustworthiness in a qualitative enquiry is to support the argument that the findings of the enquiry are worth paying attention to (Lincoln & Guba (1985). Furthermore, they proposed four criteria for assessing the trustworthiness of qualitative research, which are credibility, transferability, dependability and confirmability. To ensure that the study is credible and trustworthy, direct quotations from the participants were used when presenting the data collected.

3.8.2 Validity

The researcher ensured that the study has internal validity by making sure that the findings of the study are based on the data collected for this study only.

3.8.3 Triangulation

In this study, methodological triangulation was utilised, wherein interviews and observations were used (McMillan & Schumacher, 2014). Consequently, what the teacher said in the interview, for example in terms of what environmental integration entails, was compared with what the teacher did in class during observation.

3.8.4 Pilot study

The researcher identified one school and had an agreement with one economics and management sciences teacher. However, just before an interview could be conducted she decided to withdraw. This was a lesson that the researcher should be conscious when doing the final study that participants may withdraw. The

exercise also assisted in refining the interview protocol as well as the observation schedule.

3.9. ETHICAL CONSIDERATION

Research ethics is a world-wide set of principles governing the way any research, including interaction between the researcher and other people, is managed, designed and conducted (University of Manchester, 2012). They are mainly focused on what is morally acceptable and unacceptable when the researcher engages with the participants to access data (McMillan & Schumacher, 2014). It is important for a researcher to adhere to research ethics in order to promote the values that are important such as accountability, trust, mutual respect, fairness and to avoid misinterpretations of the research data to promote the truth or minimise errors (Resnik, 2015). In order to collect data in this research study, ethical considerations such as informed consent, voluntary participation, confidentiality and anonymity, privacy and reliability, caring and fairness were taken into consideration to ensure that the research is conducted ethically. Permissions were sought from the principal, teachers and the Mpumalanga Department of Education. This was done after ethical clearance from the University of South Africa was granted.

3.10 SUMMARY

This chapter discussed the research methodology that was adopted in this study as well as an appropriate research design. It discussed the adopted research paradigms, qualitative sampling strategies which include population and sample size, research setting and participants. It also gave a brief discussion on data collection management which covers data collection procedures such as interviews and observations. Furthermore, this chapter discussed data analysis and interpretations, data presentation and findings, the rigour of the study and the pilot study. It concluded with the ethical considerations. Chapter four will outline data presentation and analysis supporting the study.

CHAPTER 4
DATA PRESENTATION AND DISCUSSION

4.1 INTRODUCTION

This chapter presents data and its discussion as well as findings. Only the elements of data leading to the answering of the research questions are presented and discussed. The findings were aimed at answering the following research questions:

MAIN RESEARCH QUESTION:
How do senior phase teachers integrate environmental education in their teaching and learning?

SUB-QUESTIONS:

1. What is the nature of the teachers' environmental education knowledge?
2. What teaching strategies do teachers use when integrating environmental learning in the teaching and learning process (if they integrate environmental education)?
3. What challenges and opportunities do teachers have when integrating environmental education?
4. What challenges do teachers have when they are not integrating environmental education?

Three teachers (cases) participated in the study and each case is presented separately as the aim is to comprehend each case within its own context. Pseudonyms are used for the participants. They are referred to as Mrs Makhamba, Mr Mabenisa and Mr Mphophotho.

4.2 CASE 1: MRS MAKHAMBA

4.2.1 Data presentation

This section provides the combination of interviews and lesson observation data from a Grade 7 Life orientation teacher, Mrs Makhamba. Data presentation is outlined below.

A. Teacher Knowledge

It was very important for the purposes of this study to tap into what the teacher understands as environmental education. Therefore, in the course of the interviews the question was put to her as to what does she understand as environment? The teacher's explanation of what the environment is was broad. She indicated that environment is the surrounding. This is what she indicated:

> "Hmm… according to me the environment is your surroundings, the place around your area that is your environment. Your class is your environment that is how I understand it."

Her description of environmental education was also important in this study. She defined environmental education broadly as she said that it has to do with teaching the learners how to look after their environment. Furthermore, during interviews the teacher mentioned the importance of keeping the environment healthy to ensure sustainability. This gave emphasis to the fact that the teacher was of the impression that environmental education has to do with teaching about keeping the environment healthy.

It was also important not only to understand what environmental education entails according to the teacher, but to also know what it means to integrate environmental education in the teaching of the subject at school, which in this context it was Life Orientation. She indicated that the word integration on its own means combining things.

The teacher had a wrong conceptualisation of the integration of environmental education. She said that when you integrate environmental education you must always make sure that your learners are always outside checking the environment. Throughout lesson observations, it was noted that the lesson content was "abuse" which is embedded with a fair amount of environmental education issues and the teaching and learning took place in a classroom environment. Reasoning from this fact, it was quite clear that the integration of

environmental education can also take place inside the classroom, yet the teacher was not even aware of that. This was evident from the interview statement:

> "Under abuse I was talking about situations where you can find environments, where you can find abuse, different types of abuse so I tried to integrate it".

Thus, her understanding of environmental education integration was incorrect. Taking this into account, it became a misconception because environmental education in this context can be integrated inside or outside of the classroom environment. From the teachers' definition of what environmental education entails as well as its integration, it can be concluded that the teacher had inadequate knowledge about the integration of environmental education as she was not aware of what it is about, as well as when, where and how environmental education can be integrated in teaching and learning.

B. Instructional strategies

Teaching methods are the most important aspects of teaching and learning as they can enhance or hinder teaching effectiveness. It was therefore important for this study to know the teaching methods that the teacher used and how she used them to integrate environmental education. During interviews, the question was put to her directly as to which teaching methods she utilises and how they were used. The teacher said that she uses a narrative teaching method, but she did not state how. Nevertheless, her response was incorrect because during lesson observations it was observed that the teacher used an interactive teaching method. To support that, the teacher highlighted that her learners were interacting during her lesson presentation and that made her happy. This was evident from the statement below:

> "Eh… part of the lesson is when the learners are interacting in a good way. Yah when they are involved in a lesson that makes me happy."

It was also evident that the teacher used outdoor teaching method as it is perceived as teaching the curriculum in the natural environment in order to improve and promote mental, educational and physical wellbeing. This can be supported by the activities that took place in the sport field:

> "Alright come let's make a round. We must do a warm-up so that you strengthen your muscles, you cannot exercise in an environment that is dangerous. Let's elevate. When I say "one", you lift your body from the ground when I say "one" you jump when I say "two" you jump twice."

Furthermore, it was observed that another teaching method employed by the teacher was question and answer method which was beneficial to her lesson for basic information and skills during the physical education and training lesson. She applied this method by asking these questions:

> "What the importance of doing warm up? Why do we warm up? What is elevation?"

The above-mentioned findings were supported by data from interviews and observation"

C. Challenges and opportunities

It was very important for this study to be aware of the challenges that the teacher experiences when she had to integrate environmental education in teaching and learning. Determining from the interview that was conducted, the statement below made the researcher aware that the teacher barely integrated environmental education in the teaching and learning process:

> “Not always but sometimes I do integrate it depending on the topic that I am teaching at the present moment. For an example, if you are teaching rights you need to integrate environmental education… because they have to know how take care of their environment.”

Furthermore, the teacher highlighted that she does not always integrate environment education, she only integrates it on certain topics that she teaches at the time. This raised concern and caused the researcher to find out why was it a challenge that she was not integrating environmental education continuously. During interviews, the teacher mentioned many challenges that impede the integration of environmental education. She mentioned that:

> “I think the challenge is that, eh… the classes in most cases are over-crowded and that we do not have enough time to integrate environment because when you integrate environmental you must always make sure that your learners are always outside, because of the conduciveness of the class you cannot always integrate the environment even the movement is difficult in class.”

She also stated that classrooms were over-crowded which made it impossible for her to integrate environmental education as movement was also difficult in class. During lesson observations, it was observed that there was a large number of learners in a small classroom which restricted teacher movement. This could build up to another challenge because it can prevent the teacher from implementing environmental learning or approaches such as active learning, critical thinking, authentic learning, problem-solving which could be disadvantageous towards the integration of environmental education. She also indicated that there was not enough time for one to integrate environmental education. This statement was a contradiction because the teacher had enough time available to ensure that environmental education was integrated

adequately but the time was not used effectively. This was evident from the observations whereby the teacher seemed to be overwhelmed by her lesson, which led her to frequently ask about the amount of time that was remaining so that she can leave the classroom or the sports field on two different lessons that she presented.

In the course of interviews, the teacher also revealed other challenge that hinder the integration of environmental education. She stated that:

> "Also the environment, we are talking about the communities where we are working. Sometimes they do not care if there are papers around the school if they are littering, so I think that is a challenge that is there."

From the lesson observations and interviews, it was noticed that inadequate knowledge of environmental education integration and misconceptions were the major aspects that contributed to challenges that the teacher experienced. This was evident from the above-mentioned teacher responses about the challenges she experienced when she had to integrate environmental education.

It was important for this study to find out about the opportunities of integrating environmental education in teaching and learning. In the interview that was conducted, the teacher was asked about the opportunities of integrating environmental education. Her response was as follows:

> "I think opportunities are there if we can have our classes that are manageable, you can integrate this environmental education."

The above-mentioned response was very broad which led the researcher to enquire more about these opportunities. In the course of the interview, the teacher indicated that if she could have 30 learners in a classroom, it would result in an opportunity that could enable her to integrate environmental

education. Based on data collected from lesson observations and interviews it was noticed that the teacher had a limited amount of ideas and opportunities that are related to environmental education. Furthermore, the researcher observed that the teacher was not even aware that it is possible to integrate environmental education in an over-crowded classroom like she did when she taught about “abuse”.

4.2.2 Discussions and findings

A. Teacher knowledge

The content knowledge of the teacher refers to the amount of knowledge and understanding about the planning and organising of teaching and learning approaches (Ma’rufi, 2018). It was very important for the purposes of this study to tap into what the teacher understands about the environment, integration, environmental education and how to integrate environmental education in the teaching and learning process as this shapes the study. The teacher considered the environment as a surrounding, which was very broad in this regard. This would mostly be how Ward et al., (2013) defined the concept of environment, as surroundings of and influences on a particular world or interest.

It was very important to acknowledge that the concept of environment is very complex as it is embedded with a lot of variables that surround human beings as well as living and non-living things. Hence the teacher’s definition of environment was very broad, and it was evident that the teacher failed to acknowledge other variables or aspects that constitutes towards the surroundings as her main focus was a classroom which she perceived as being her surrounding. Thus being said, Kalavathy (2004) suggested that the environment consists of a whole system that is constituted by social, cultural, physical and biological elements which are interlinked individually. Therefore, the amount of knowledge that the teacher had about the environment was inadequate.

The teacher showed adequate knowledge about the term “integration” where she described integration as combining. This relates with Rouse (2018) who stated that integration refers to the act of combining. The teacher had a correct conceptualisation of integration.

It was also important for the purpose of this study to find out what the teacher understands about environmental education. According to Kapoor (2011) environmental education should be an important part of the educational process that is aimed at building a sense of values, solving practical problems of an interdisciplinary character and contributing to public well-being. The teacher was of the opinion that environmental education has to do with teaching learners how to look after their environment. The teacher’s idea of environmental education is likely to fit within Adkins’ perspective, who stated that the aim of environmental education is to develop environmentally literate citizens with the core knowledge and skills that are needed to take responsible action regarding to the natural environment (Adkins, 2002). Furthermore, the teacher was of the opinion that environmental education has to do with teaching about healthy environment. This would mostly relate to Abboud (2018) who mentions that environmental education focuses on educational processes that have to remain neutral by teaching individuals critical thinking and enhancing their own problem-solving skills in a participatory approach. It was evident that the teacher had an idea of what environmental education is, yet her understanding and interpretations were embedded with lot of limitations that led to misconceptions of this concept.

The teacher had an incorrect perception of what environmental education integration is. She stated that when you integrate environmental education you must always make sure that your learners are always outside checking the environment. However, the researcher is of the opinion that environmental education can be integrated inside and outside of the classroom. This relates with Abboud (2018) who mentions that environmental education can be

integrated formally and informally in schools, classrooms or in an outdoor learning environment. In conclusion to that, the teacher knew what environmental education entailed and what it is to integrate but she did not integrate environmental education adequately from the lesson observed because she did not know how, where and when to integrate environmental education.

B. Instructional strategies

In the course of the interview that was conducted with Mrs Makhamba, she mentioned that she used a narrative teaching method. However, in practice, the teacher used interactive method, question and answer method and outdoor learning. An interactive teaching method encourages learners to participate actively in teaching and learning as it makes use of questions to enhance discussions (Yakovleva, 2014). The teacher used this method during the lesson presentation of abuse and physical education and training whereby she ensured that she asked questions that encouraged responses and related learners to real life situations. This method encouraged discussion during lesson presentation as she was able to relate the content of abuse to real life situations that affect individuals and the environment as a whole.

Furthermore, the teacher applied hands-on learning strategies during outdoor learning in order to increase environmental awareness. This relates with Senthamarai (2018) who came up with guidelines that teachers must use in order to implement interactive methods such as asking questions that stimulate discussions, hands-on experience, responses and set up workgroup environments which encourage active participation. This corroborates with Kostova (2007) who states that successful teaching and learning about environmental education is closely related to teaching methods that are used by the teacher. However, this method also serves as a disadvantage for the teacher. She found it difficult to tell whether learners were discussing what she asked related to the content or something that was irrelevant.

The teacher also applied question and answer method during outdoor learning. Question and answer method refers to a method that allows a teacher to create and sustain an intellectual stimulating classroom environment and acknowledges the value of the learner in that environment (Brewer, 2001). Outdoor learning is the instructional use of natural and built areas through direct experience (Woodhouse et al., 2000). During outdoor learning the teacher asked questions about the importance of doing warm-up exercises and to explain the term “elevate”. This method served as a disadvantage throughout the lesson because the questions she asked were not answered and some of them were answered incorrectly. This was evident during outdoor learning.

C. Challenges and opportunities

The teacher encountered an amount of challenges when she had to integrate environmental education in her lessons. The teacher highlighted that she does not integrate environmental education often, she only integrates it sometimes depending on the topic that she teaches at that present moment. However Hudson (2001) mentions that it is important to ensure that environmental education is integrated daily as it is a vital component of efforts to solve environmental problems.

The teacher mentioned that environmental education integration was time-consuming since she had to apply all of the relevant aspects of integrating it. This relates to Rahman et al., (2018) who found that teachers were challenged by time constraints. In addition to that, during the researchers’ teaching practice experience it was observed that some teachers perceived environmental education as something that is time-consuming, which makes it difficult for them to integrate environmental education.

Lastly, the teacher also mentioned that overcrowded classrooms made it difficult for her to integrate environmental education. However, the researcher is of the opinion that environmental education can be integrated in an over-crowded classroom only if the teacher is committed to integrating it. The above

statement relates to Baruth (2009) who found out that most teachers are not interested to teach in a learning environment that consists of over-crowded classrooms. This evidently shows that this is one of the challenges that is constantly faced by teachers and this gives an indication that it is not resolved yet.

Challenges that impede the integration of environmental education require that researchers look at the way they do research and train teachers about environmental education (Hudson, 2001). However, Rahman et al., (2018) are of the opinion that the identified challenges can be addressed by teacher's competency in integrating environmental education and the usage of creative teaching approaches as well as getting support from all relevant stakeholders. Environmental education provides important opportunities for teachers and learners to become engaged in real world issues that transcend classroom walls (Campbell, 2014). The teacher believed that there are opportunities that one can utilise in order to integrate environmental education effectively such as having manageable classes that consist of no more than 30 learners. The teacher's response showed that the teacher was of the opinion that environmental education can be integrated in outdoor situations only, which is incorrect because it can be integrated inside or outside of the classroom environment.

The teacher mentioned that it was important for learners and the community to understand the importance of having a healthy environment as that will open more opportunities for one to learn more about the environment. This relates with Stone (2010) who found that the integration of environmental education is important as it educates learners about the natural environment so that they can live in a way that one respects and does not damage the environment.

4.3. CASE 2: MR MABHENISA

4.3.1 Data presentation

This section provides the combination of interviews and lesson observation data from a Grade 7 technology teacher, Mr Mabhenisa. Data presentation is outlined below.

A. Teacher knowledge

During the interviews the teacher was requested to explain the word “environment”. He indicated that environment refers to the nature that we live in which accommodates living and non-living things. This was evident in the statement from the interview below:

> “Environment is nature that we live in. We refer to all the species that are found in the environment whether living or non-living.”

The teacher was of the opinion that environmental education was about creating awareness and developing a deeper understanding about the environment that we live in. This was evident in the statement from the interview below:

> “Environmental education is about giving people knowledge about the environment where they live in, so that they become aware as to what is it in the environment that they must take care of and how to protect the environment where they are living in.”

The evidence supporting the above-mentioned statement was observed in the classroom when he was teaching. He presented a lesson about investigating cell phone towers, and ensured that he raised awareness and sensitivity about the environment, taking into consideration visual pollution when building a cell phone tower. In this study, visual pollution is defined as a visual issue that harms one’s ability to enjoy a certain view. The teacher emphasised the importance of being aware of visual pollution, which can harm the environment by creating harmful changes in it and consider the environment where the tower will be situated.

Furthermore, he emphasised building a cell phone tower structure that is disguised so that the environment, people or animals who are around there would not be visually polluted when they look at the tower. He also gave an example about nature reserves where he emphasised the significance of making a tower look like a tree so that animals are protected from visual pollution. During lesson observation, he indicated that:

> "We said if your tower is in a particular environment, your tower must be disguised so that the environment must not be polluted when they look at the tower. When the environment, people, or animal who are around there, when they look at the tower they must not be visually polluted."

For the purpose of this study, it was important to find out what the teacher understands about the word "integration" as it is related with environmental education. He indicated that integration refers to accommodating different types of things that can be found in the environment. During interviews, he stated that:

> "Integration refers to accommodating different types of things that we find in the environment, which means we need to link them to those that are living and non-living things so that we able to achieve a good habitant on the environment."

It is important to commence a new lesson topic with prior knowledge as this can result in active participation and make a lesson more meaningful for the learners. Furthermore, it serves as an advantage for any teacher as they are able to make a lesson as engaging as possible. During lesson observations, the teacher did not administer prior-knowledge when he introduced the cell phone tower frame structure topic. However, when he administered prior-knowledge he was able to make the lesson more effective as he related the content that he taught to real life situations which resulted in active participation

throughout the lesson. The teacher was observed starting some of his lessons with prior-knowledge. When he taught about structures, he asked the following question:

> "According to your understanding or knowledge, what is a structure?"

In the course of the interviews, the question was put to him as to what are the misconceptions that are associated with the integration of environmental education. The teacher was of the opinion that learners do not know much about the environment and that teachers must do things practically. He mentioned that:

> "In most cases, learners do not believe much in the environment unless you have to teach them, and most of the learners, require that we do these things practically if possible. Whatever we deal with that is about environment, we take them to the particular place to see what we are talking about."

Furthermore, he mentioned that as a teacher, you must ensure that you do things that are related to environmental education in a practical manner, if possible. During lesson observations, the teacher integrated environmental education when he taught about building a cell phone tower structure and different types of environments where one can find pilot structures, headgear structures and windmill structures. Nevertheless, he was not aware of it because he was of a mind that environmental education can only be integrated through practical and school excursions.

Taking this statement into account, it develops a contradiction based on what the teacher said and did about the integration of environmental education in teaching and learning. He was of the opinion that environmental education can be integrated in the content that is related to environmental education only, in a practical way and through school excursions, if possible.

As a result, the above-mentioned statement on its own is a misconception because there are various methods that teachers can use to integrate environmental education as it is not only through practical education and school excursions. Thus being said, one does not need to do practical and school excursions for all of the lessons that they teach in order to integrate environmental education in the teaching and learning process.

In fact, environmental education can be integrated in schools, classrooms or any other various non-formal education programs such as experimental outdoor education. In addition to that, the teacher did not have adequate knowledge about how to integrate environmental education. It can be inferred that the teacher experienced challenges when he must integrate environmental education in a content that does not take into account practical work such as the cell phone tower project that they did.

It was also evident that he had a limited amount of knowledge and skills on how to integrate environmental education in lesson content which does not cover practical education and school excursions. Thus being said, the teacher had misconceptions and inadequate knowledge about the integration of environmental education.

B. Instructional strategies

Choosing appropriate teaching methods plays an important role towards the effective integration of environmental education. Therefore, it was important for the purpose of this study to be familiar with the teaching methods that the teacher applied and discover how they were carried out in the teaching and learning process. During the pre-interviews that were conducted, the teacher was asked about the teaching strategies that he used when he integrates environmental education. He stated that:

> “I normally use question and answer method and I use instructional method.”

However, he was unable to elaborate on how he applied these strategies. During post-observations interviews, he mentioned that he also used lecture method and question and answer method. Nonetheless, his response was not comprehensive because during the lesson observations that were conducted it was observed that the teacher also applied the project method, which he did not mention during the course of the interviews. A project method was applied in the content of cell phone tower structures whereby the teacher instructed learners to work in groups so that they could build a cell phone tower structure and present it to the class. This was evident in the statement below:

> "Now when you make your project you need to consider the environment. Where your tower is going to be placed, what kind of environment is your tower going to be placed."

In addition to that, it was observed that the project method that the teacher used was beneficial in the process of integrating environmental education. The teacher was able to raise awareness, knowledge, application skills and being responsible towards the environment. During the interviews, the teacher asserted that he used question and answer method. When he taught about building a cell phone tower, he integrated environmental education through enhancing critical thinking skills, raising awareness about the environment and environmental issues. He administered question and answer method to integrate environmental education through asking these questions:

> "What is a nature reserve? When we say a structure is natural?"

He also applied lecture method when he taught about the three types of structures. During lesson observations the teacher was seen conducting cell phone tower project presentations in class, whereby he was a facilitator of the whole presentation process. This was evident from lesson observations:

> “Tell the class, why did you do make a project like that. Tell the class why you decided on the type of project you did. Tell the class, what was easy or what was difficult”

The teacher was observed applying an interactive teaching method during his lesson which he did not mention during the interview process. This method was applied when he taught about the three types of structures, and it was beneficial to his lesson as he was able to increase awareness and knowledge of environmental issues to encourage individuals’ thinking and problem-solving skills. Therefore, it was clear that the teacher administered various instructional strategies for his lessons.

C. Challenges and opportunities

It was very significant for the purpose of this study to acknowledge challenges that Mr Mabhenisa experienced when he had to integrate environmental education in the subject that he teaches, which is technology. The teacher was asked about the challenges that he experiences when he has to integrate environmental education. His main challenge in this regard is the language barrier, which contributed as one of the factors that hindered him from integrating environmental education in teaching and learning effectively. This was a challenge because learners did not seem converse much in the language of teaching and learning which is English. It also hindered the effective integration of environmental education. This led the teacher to teach some of the content in their mother tongue language. He indicated that:

> “Unfortunately, what we have right now is a situation whereby our learners do not converse that much in English. Therefore you need to keep on moving from English to mother tongue most of the time.”

Additionally, the teacher mentioned that he does integrate environment education. However, based on the interview that was conducted it was

revealed that what he said was contradictory with what he was doing. Based on the findings, it was observed that the teacher did not integrate environmental education effectively across the curriculum due to some misconceptions that he had which contributed towards the challenges of environmental education integration. The teacher mentioned that environmental education can only be integrated through practical education and school excursions.

The researcher is of the opinion that the above statement contributes towards the challenges because it clearly demonstrates that environmental education is not integrated effectively in some of the learning topics that do not accommodate for practical education and school excursions. Due to this the teacher did not know how or which strategies he could administer to integrate environmental education.

This made the researcher curious to find out more about the challenges that he experienced. During the interviews, he mentioned numerous challenges that impeded the integration of environmental education. He indicated that a lack of learning materials served as a challenge as it impeded the integration of environmental education in teaching and learning process. He indicated that:

> "Sometimes we have a handicap of learning material. When you request the purchasing of learning materials, sometimes it is an issue."

In addition to that, it was evident from the lesson observations that were conducted that the teacher was unable to administer the hands-on project of building a cell phone tower effectively due to insufficient materials. Materials such as wires, batteries or bulbs that were needed to build the cell phone tower project but were not available. This had an impact in the integration of environmental education because the teacher was not able to raise awareness about the important specifications that should be evident when building a cell phone tower so that the environment can be protected.

During lesson observations it was observed that the teacher had a limited amount of textbooks for the technology subject. This served as a challenge towards the integration of environmental education in the lesson that he presented about different types of structures. He used a textbook as learning material, which was shared by three to five learners per textbook. This hindered the integration of environmental education due to insufficient textbooks as he asserted that he integrates environmental education by using pictures that are available in the textbooks. This was evident in the statement from the interview:

> "I try to explain to the learners, and we use the pictures that are available on the textbooks."

For the purpose of this study, it was important to find out more about the opportunities of integrating environmental education. In the course of interviews, the teacher was asked whether he integrates environmental education or not. The teacher mentioned that he does integrate environmental education. The researcher was curious to find out how he integrates environmental education. He stated that he tries to explain to the learners and they use the pictures that are available in the textbook. During lesson observations, the teacher was observed using pictures that are available in the textbooks when he taught about structures. This created an opportunity that allowed him to relate the lesson topic to real life situations which enhanced knowledge and understanding of the environment. He mentioned that:

> "I try to explain to the learners, and we use the pictures that are available on the textbooks."

The above statement led the researcher to enquire more about the importance of integrating environmental education. The teacher indicated that it is important to integrate environmental education in the teaching and learning process. He highlighted that:

> “Yes, I think it is, because we are living on the environment and there are many dangers that are posed by the environment that we are not aware of. In addition, even learners themselves they need to be aware about the other things that we find in nature that are good which may be regarded as bad.”

Based on the data collected from interviews and lesson observations, it was evident that the teacher was aware of the importance of integrating environmental education. However, he was only aware of a limited amount of opportunities that are associated with environmental education integration. He was able to acknowledge the importance of integrating environmental education, but he had a limited amount of knowledge about the opportunities that come with it. Thus being said, it was quite clear that the teacher might be able to integrate environmental education in teaching and learning effectively, provided that there is sufficient support and intervention that will contribute towards developing a better understanding about the integration of environmental education.

4.3.2 Discussions and findings

A. Teacher knowledge

The content knowledge for teaching refers to the practice-based theory that describes the content knowledge involved in teaching a certain subject (Ball, 2000). It is important to assure the existence of three types of knowledge that is necessary for good teaching such as curriculum knowledge, content knowledge and pedagogical content knowledge as it provides a solid foundation for effective teaching and learning processes (Gess-Newsome et al., 2019). It was imperative for the purpose of this study to tap into what the teacher understands about the environment, integration, environmental education and how to integrate environmental education in teaching and learning processes as this shapes the study.

The teacher indicated that environment refers to the nature that we live in which accommodates living and non-living things. This relates to Kalavathy (2004) who defined environment as a complex of numerous variables which surround human beings as well as all living organisms, it also takes into account the relationship that exists between human beings, non-living things and other living things. It was important to acknowledge that the concept of environment can be defined in different ways as it is very broad. As a result, it is reasonable to conclude that the teacher had adequate knowledge about the concept of the environment.

The teacher showed sufficient knowledge about the term “integration” when he explained integration as a process of accommodating different types of things that can be found in the environment, which means we need to link them to those that are living and non-living things so that we able to achieve a good habitant on the environment. This relates to Brunnstrom (2006) who specified that integration means that the environment will have to be included as a natural element in all activities that take place.

It was very important for the purpose of this study to find out what the teacher understands about environmental education. The teacher was of the opinion that environmental education is about giving people knowledge about the environment where they live in, so that they become aware as to what is in the environment which they must take care of and how to protect the environment where they are living in. This would mostly relate with Msezane (2014) who emphasises the importance of developing a deeper understanding and acquiring knowledge of environmental education as it serves an important element since a degraded environment means a lower quality of life for the whole world. Furthermore, environmental education allows individuals to come up with approaches for problem-solving skills and taking action to maintain the environment to ensure that it continues to be sustainable (Komane, 2005). Thus, it was quite clear that the teacher had sufficient knowledge about environmental education as evident from the data that was collected from interviews and lesson observations.

It was also evident that the teacher had insufficient knowledge about the integration of environmental education in teachinPPg and learning process. He asserted that the integration of environmental education can only be integrated through practical education and school excursions. The above-mentioned statement was a misconception and a contradiction towards what the teacher said and did in the classroom environment because there are various methods that a teacher can use to integrate environmental education effectively such as active learning, critical thinking, authentic learning and problem-solving (Lotz-Sisitka & Raven, 2001). Furthermore, Abboud (2018) is of the opinion that environmental education can be taught in classrooms, schools, or can take place in informal learning contexts through media, natural centres, botanical gardens, bird watching or ecotourism. As a result, the teacher displayed inadequate knowledge about how to integrate environmental education.

Prior-knowledge is defined as the amount of knowledge that one has already integrated into their understanding of the content (Wenk, 2017). For that reason, it is important to engage prior-knowledge in the teaching and learning process in order to enhance active participation. During the introduction of the new lesson where the teacher focused on building a cell-phone tower structure, prior-knowledge was not implemented in the lesson. In addition, the application of prior-knowledge was evident in some of the lessons that he presented. When he taught about structures, the teacher commenced his lesson by tapping into learner's prior-knowledge of structures. He applied prior knowledge by asking what learners understood or knew about the structures in question. This provided a basis that the teacher acknowledged as the importance of engaging prior-knowledge in the teaching and learning process, although it was not implemented in all the lessons that he presented. Therefore, it can be concluded that the teachers' implementation of prior-knowledge was satisfactory. Thus being said, it was important for teachers to determine the prior-knowledge that learners have before they teach, as it can assist them to understand the topic that is being taught. In this regard, prior-knowledge was not administered effectively by the teacher.

The teacher had misconceptions about the integration of environmental education. Misconceptions can impede the learning of new knowledge as misconceptions are often difficult to identify and resistant to refinement through the standard of instruction (Bensley, 2015).

It was important for the purpose of this study to find out about the misconceptions that the teacher had developed about the integration of environmental education. In the course of the interview that was conducted with Mr Mabhenisa, he mentioned that environmental education can only be integrated through practical education and school excursions method. This statement was a misconception because there are various methods of teaching environmental education other than the ones that he mentioned which are practical education and school excursion methods.

Abboud (2018) is of the opinion that teachers should deliver environmental education in a different way as it is not only based on science but also concerned with political, historical and cultural aspects with the human dimension of socio-economic issues. Smith et al., (2014) state that there are many teaching methods that are helpful when a teacher wants to integrate environmental education such as using action projects, case studies, debate, demonstration, discovery demonstration, discussions, experience, games and inviting guest speakers. As a result, it was evident from the lesson observed and the interviews that were conducted that the teacher had developed misconceptions that hindered him from applying various methods or strategies to integrate environmental education.

B. Instructional strategies

Instructional strategies refer to a broad plan of action for the teaching and learning process in order to achieve the desired outcomes of the lesson (Rossouw, 2012). For the duration of the interview that was conducted with Mr Mabhenisa, he mentioned that he used lecture method, question and answer method and instructional method. However, during lesson observations it was observed that he also used the interactive learning method and project

method. An interactive method refers to an interaction between the teacher and learners whereby they interact with one another during class, not just as passive listeners but active participants (Karayani, 2003). A project method refers to a teacher facilitated collaborative approach in which learners acquire and apply knowledge and skills to solve problems (Howell, 2003).

The teacher used question and answer method, which is considered as the most important technique in the teaching and learning process as it is allows the teacher to bring knowledge to a conscious level and provide strategies to achieve cognitive objectives (Farroq, 2012). The evidence underpinning these findings were sound as the teacher was seen executing this method throughout his lesson of building a cell phone tower structure. During lesson observations, the teacher asked these questions; what is a nature reserve? What do you find in a nature reserve? This method developed advantages throughout the lesson because the questions that he asked were answered and this resulted in effective learning. This relates with Gabler and Schroeder (2003), as they confirm that effective questioning is the true essence of effective teaching and one of the most effective strategies to enhance critical thinking skills. This method facilitated the integration of environmental education as it allowed the teacher to use critical thinking skills towards the resolution of environmental problems that can be created by cell phone towers as a key objective of environmental education. The teacher also used project method. A project method refers to an active learner-centred approach of teaching which consists of investigations, collaborations, goal setting and reflection within real-world situations (Kokotsaki et al., 2016). The teacher used the project method for the topic of building a cell phone tower structure to ensure that every learner participated in this project. However, during lesson observations it was evident that the project method made it impossible for the teacher to integrate environmental education effectively. Challenges appeared such as a lack of materials that were needed to complete the cell phone tower structure, which in this case were bulbs, wires and batteries. This relates with Jacobs et al., (2002) who mention that project should be challenging, problem-

solving in nature and be realistic within the field of interest to the teacher and learner. Thus being said, the application of this project method had limitations that made it impossible for the teacher to integrate environmental education.

Interactive method was also applied by the teacher in the classroom. The teacher used this method by engaging learners in his lesson about building a cell phone tower structure, and the three types of structures. It was evident that this method managed to involve both the teacher and learners in the process of teaching and learning as it effectively encouraged learners to participate. The teacher made use of questions to enhance discussion and give learners a hands-on experience. This relates with Yakovleva (2014) who mentioned that this method is able to solve problems effectively. However, it was very difficult for the teacher to tell whether learners were discussing academic related content of structures or something that is irrelevant. Thus being said, this method had minimal limitations.

C. Challenges and opportunities

During the interviews, the teacher mentioned an amount of challenges that he came across to when he had to integrate environmental education in his lessons. The teacher mentioned that the language barrier is a challenge which contributes to one of the factors that impedes the integration of environmental education in teaching and learning effectively. This was a challenge in the integration of environmental education as the teacher kept on teaching in their mother tongue language so that they could understand some of the concepts that are embedded within environmental education. He also indicated that learners do not converse much in English, which requires him to move from English to their mother tongue. This relates with the research that was conducted by the United Nations Educational, Scientific and Cultural Organization (2008), which shows that difficulties in language can have a negative impact on the teaching and learning process.

The teacher mentioned that environmental education can only be integrated through practical education and school excursions. However, Marzano (2007)

conducted research which revealed that there are numerous other visual or dramatic methods that have a larger impact on learning that are solely verbal and that can be implemented. Thus being said, the researcher is of the viewpoint that above statement contributes towards the challenges because it clearly demonstrates that environmental education is not effectively integrated in some of the learning topics that do not accommodate practical education and school excursions. It was clear that the teacher had inadequate subject knowledge and had developed numerous misconceptions on how to integrate environmental education.

Furthermore, there is a lack of trained personnel who can teach educators how to integrate environmental education, which makes it difficult for teachers to know other strategies or methods to apply. Additionally, Sinko (2002) revealed that a lack of support for educational personnel creates barriers to the successful integration of environmental education. As a result, a lack of training in relation to environmental education amongst teachers has given rise to teachers having inadequate knowledge about environmental education, which results in teachers being unable to integrate environmental education effectively in their teaching and across curriculum (Kin et al., 2004).

Environmental education provides opportunities for teachers and learners to see the relevance of their classroom studies to the complex environmental problems that are confronting our environment (Campbell, 2014). The teacher was not aware of the opportunities that are there when one integrates environmental education. However, he was able to highlight the importance of integrating environmental education in teaching and learning. The teacher mentioned that it is important for one to integrate environmental education because we are living in an environment whereby there are many dangers that are posed to the environment that we are not aware of.

This relates with Abboud (2018) who states that environmental education provides opportunities to develop awareness and understanding of environmental issues and have effective skills that can be utilised to make informed decisions. The teacher mentioned that we need to be aware of living

things that we find in nature so that we are able to make decisions that are not harmful to our environment.

4.4 CASE 3: MR MPHOPHOTHO

4.4.1 Data presentation

This section provides a combination of interviews and lesson observations data from a Grade 7 Natural Sciences teacher, Mr Mphophotho. Data presentation is outlined below.

A. Teacher knowledge

It was important for the purpose of this research study to tap into what the teacher understands about the key concepts that are interrelated with the integration of environmental education. The teachers' understanding of these concepts plays an important role in shaping the purpose of this study. As a result, the teacher was requested to give details based on what he understands about the word "environment". His response about environmental education was broad as he indicated that environment can be defined in various ways depending on the approach of certain topics that he engages himself with. He revealed that environment is based on the surroundings, where we stay, which is also a situation whereby there is life and even where there is no life. He mentioned that:

> "The environment is based on the surroundings where we are staying, it depends on where you are. Now, when we talk of surroundings and the environment, we are referring to a situation whereby there is life and even where there is no life. It will depend on the approach of the topic that we are dealing with yes."

Based on the above-mentioned statement by the teacher, it was also evident that the teacher is aware that the concept of environment can be defined in

various ways, as he mentioned that the way one can explain the concept of environment will mainly depend on the approach of the topic that one is dealing with.

It was important to find out how the teacher interprets environmental education. The teacher was of the opinion that environmental education refers to being educated by your surroundings. He mentioned that:

> "Being educated by your surroundings, for example being taught on how to take care of your environment. Having a skill to see problems that affects your surroundings and find ways on how to solve them"

The evidence underpinning his statement was comprehensive because during lesson observations it was observed that he presented a lesson on recycling, whereby he taught about issues that affect the environment, which in this context was pollution and landfills that are not managed properly. This was evident in the statement below:

> "Pollution right, is going to be exposed. So remember we do not want to pollute the surrounding. It is very much important to make it a point that our surrounding is conducive, therefore we must prevent that, we must prevent pollution. Whenever we dump something there, and we leave it, whenever there is wind the wind we blow the rubbish and our surrounding is polluted."

Furthermore, the teacher was able to relate the lesson of recycling to real life situations that affect the environment in a way that encourages learners to improve and resolve environmental challenges. He did so by giving them an illustration of what is currently happening in the community that they are situated so that they can develop a deeper understanding of environmental issues. He mentioned that:

> “There are old women and men that use to move along the road, collecting tins and bottles. They are taking those tins and bottles for recycling. You understand what am I saying?”

It was important not to only understand what environmental education is according to the teacher but to also be familiar with the concept of integration in order to develop a basis of the integration of environmental education in context of the Natural Sciences subject. His response on the word “integration” was rather broad, as he mentioned that integration refers to taking different subjects and looking for what is common in them, he even engaged various examples to ensure that one can easily understand what he meant. He mentioned that:

> “To integrate is to take different subjects; for example, you look for what is common in it, and whenever you are teaching that subject, you refer to the other learning areas.”

However, as much as his above-mentioned statement was broad at first glance, he elaborated further to support his description so that it could have a clearer meaning. He indicated that:

> “For example, I can integrate science with mathematics, if I take learners outside and say let them be in groups, then I tell them to make groups of five members, it is also part of mathematics. I am integrating, I am not be teaching in digits; but I will be talking about numbers. In addition, I will be talking about numbers when I say let us go to a dumping zone to sort materials, we will also count them, by doing so, we will be integrating.”

Based on the statement above, it was evident that the teacher indeed practiced what he said about integration. When he gave learners a practical task

assessment about the separation of ink by chromatography, he instructed them to form groups of 8-10 members so that they could complete the given formal assessment of conducting a chromatography investigation.

However, it was evident that the teacher was not able to explain the concept of integration effectively as he mainly depended on illustrations. Nevertheless, he was able to present various examples that demonstrated how the integration process takes place in the teaching and learning process. Therefore, based on the data that was collected from the interviews and lesson observations it was evident that the teacher had a correct conceptualisation about what environment, environmental education and integration entail.

Starting a lesson topic with prior-knowledge serves as a benefit for teachers as it enhances effectiveness in the teaching and learning process. In addition to that, it contributes towards making a lesson as engaging as possible. It allows teachers to tap into existing knowledge that learners already have. The teacher was observed utilising prior-knowledge when he taught about recycling. He applied prior-knowledge by asking questions about what recycling is and why is it important to separate rubbish if you wish to recycle.

During lesson observations it was noticed that the application of prior-knowledge was not evident in some of the lessons that the teacher presented, especially when he taught about careers in chemistry, mining and waste management. As a result, the teacher was unable to tap into the knowledge that the learners had already developed. His main concern was just curriculum coverage and the completion of the separation of ink by chromatography practical assessment on time.

In the course of the interviews, the teacher was questioned about the misconceptions that are connected with the integration of environmental education. In the beginning, his response about the misconceptions was broad, which made it challenging for the researcher to comprehend what he meant. He stated that:

> “Sometimes we take things easy to say integration of environmental education issues in education they are not right, because sometimes we take the learner to dumping zones it is not nice (safe). However, remember for learner to know that, we have to take them there because now they must experience and see what is said of when we talk about environmental impact; they must see it and they should be able to have an input on what they observed.”

Based on the above statement, the teacher was of the opinion that misconceptions of environmental education are caused by the conflict of interest between what is right and wrong about the integration of environmental education. He indicated that different learning environments are not catered for as teachers normally prioritise the safety of learners which leads them to be reluctant towards the integration of environmental education. As a result, they develop misconceptions that environmental education cannot be integrated in various ways because they are not aware of safety measures that they can implement to avoid any dangers that can occur in different learning environments that are perceived to be not conducive to learning.

Nevertheless, the teacher had a misconception of the integration of environmental education. He was of the opinion that the integration of environmental education can only be integrated in some school subjects and through practical assessment. This was evident from the statement below:

> “Some schools subjects have contents on how to take care of your environment for example pollution. While they are being taught about that a practical assessment can be done so that they can aware or shown practically how are we polluting our environment and given clues on how that can be solved.”

Based on the above statement the teacher developed a misconception because environmental education is integrated across all subjects in the South

African curriculum and there are strategies that can be used other than practical assessment to integrate environmental education. Thus, it was evident that the teacher had a limited amount of knowledge when it comes to the integration of environmental education.

During post-observation interviews the teacher mentioned a statement that was contrary to what he did. When he was asked about the part of the lesson presentation that he enjoyed the most. He stated that:

> "The separation of mixtures of colour especially when I investigated the black I found that black is a secondary colour, and I found out that black is made from different colours, that was so much interesting."

Taking this statement into account, it developed into a contradiction based on what the teacher said and did about the integration of environmental education in teaching and learning. In fact, it became a misconception because during lesson observations there was no experiment or practical that took place whereby the teacher was seen investigating the mixtures of colours, even his findings are not accurate because there was no evidence that supported what he asserted.

B. Instructional strategies

Instructional strategies are the most important traits of teaching and learning as they can improve or impede teaching effectiveness. It was therefore important for the purpose of this study to know the instructional strategies that the teacher used and how he used them to integrate environmental education. In the course of interviews that were conducted, the question was put to him as to which teaching methods he used and how he used them. The teacher stated that the teaching methods that he uses will depend on the given scenario, he indicated that he uses question and answer method and jigsaw

methods, however during lesson observations the researcher noticed the use of outdoor learning method, discussion method and textbook method.

Furthermore, he gave illustrations on how he uses these methods. For outdoor learning and question and answer method, he stated how he uses these methods:

> "Perhaps we are talking about the environment; I can ask them what they understand about the environment, they will answer. We will then take them and go observe outside. We will then take it into a classroom situation and then we are going to interact with learners, by asking them questions and they ask me questions; that is a strategy that I can employ."

The above statement was just an illustration on how he can use the question and answer method as well as outdoor learning method. Nonetheless, the use of these methods was apparent during lesson observations. It was noticed that the teacher used question and answer method when he taught about recycling. He employed this method by asking:

> "What is recycling? Why is it important to separate the rubbish if you wish to recycle?"

During lesson observations it was evident that the teacher used outdoor teaching method, however the teacher failed to acknowledge the usage of this method during the interviews. This method was implemented in the course of the practical assessment of separating ink by chromatography where the teacher instructed learners to go outside in order for them to group themselves in groups of 8-10 members so that they can conduct the chromatography investigation. This was supported by the statement below:

> "We are going outside; I want us to finish the practical. Let's listen, we will take 5-8 Minutes. We all go outside, you group yourselves into groups and then, thereafter we come back,

> and when we come back, listen to what I say, when we come back. We are going to sit in groups. This group or these two rows, you will make your groups and you come and occupy these two rows. Are we together?"

The use of this method was not beneficial because the teacher was unable to integrate environmental education effectively due to the fact that the experiment of this practical assessment was not conducted due to a lack of learning materials. This led to the recording of findings based on assumptions as there was no evidence to support their findings.

The use of textbook method was evident when he presented a lesson about recycling and careers in chemistry, mining and waste management, with a textbook being the main teaching aid in the classroom. This was evident in the statements below:

> "Look on page number 181, mining and waste management, look at number 1, you all read from top, career in chemistry, mining and waste management all of you"

Furthermore, the teacher demonstrated how he can use jigsaw method in teaching and learning process. He mentioned that:

> "I can also employ the jigsaw methods strategies, whereby I will call them by alphabets looking at their names or I might give them numbers, thereafter they answer according to the sequence numbers or the pattern that I give them to answer."

The above statement was just an illustration on how he can use jigsaw method because during lesson observations the researcher noticed that this method was never implemented by the teacher in the teaching and learning process. Thus being said, the teacher was unable to answer questions based on teaching methods that he used to integrate environmental education, rather he only managed to give illustrations on how he can implement them as he

mentioned that the teaching strategies that he uses will mainly depend on the scenario. Therefore, he was not able to highlight the teaching strategies that he used in his lessons.

Furthermore, in an interview that was conducted, the teacher did not mention the use of discussion method. However, during observations it was noticed that the use of this method ensured that he engaged his learners effectively in a manner that he was able to make his lesson more meaningful by employing various methods. The evidence underpinning the use of this method was seen when he taught about careers in chemistry, mining and waste management:

> "If you look at photo number 1, what do you see there? Or what do you think is happening there? Photo number 1. According to you, can you guess what type/kind of material is that one"

C. Challenges and opportunities

The teacher was asked about the challenges that he experiences when he has to integrate environmental education. He mentioned that a lack of learning materials and school environment contributes to the challenges that he experiences when he has to integrate environmental education. He stated that:

> "Challenges are always there, because when you integrate environmental education, sometimes you might not have enough material to use in class, especially those that can help learners to easily understand, sometimes you want to integrate education with the environment, but the school situation does not allow us."

It was important for the purpose of this study to find out about the opportunities of integrating environmental education in teaching and learning. The teacher asserted that he does integrate environment education in the teaching and learning process. His positive response prompted the researcher to find out

how he integrates environmental education. His statement emphasised more on using different learning environments in order to enhance better understanding of the lesson content presented. He asserted that:

> "Whatever we are experiencing outside, we must take it into a classroom situation. Whatever we are talking to learners, some learners might understand visual things. So now, whenever we take something on the environment outside into a classroom situation then learners understand it better."

His response led me to find out more about the importance of integrating environmental education as it contributes towards an opportunity that will enable the teacher to be able to integrate environmental education effectively. The teacher indicated that it is important to integrate environmental education in teaching and learning process. He asserted that:

> "I think it is important because when you talk of environmental education (remember the environment is a situation whereby we live), therefore, whenever we talk about the environmental education we are looking at the different things that we come across. For example, if we talk of conducive hygiene, therefore it means we must talk about the environmental issues."

In addition, the teacher was of the opinion that there are many opportunities to integrating environmental education. He mentioned that:

> "Opportunities are many, because whenever you integrate learning, the learners tend to learn and develop love of doing something at home. For example, when you talk of the environment, there is this thing of hand sorting and Chromatography, all those things they are opportunities for learners to learn and be encouraged that in future, I can do

this, it is very much important to know the environmental impacts."

Based on data collected from interviews and lesson observations, it was evident that the teacher was aware of the importance of integrating environmental education as well as opportunities that are associated with it. As a result, the teacher was able to recognise the importance of integrating environmental education.

4.4.2 Discussion and findings

A. Teacher knowledge

The teacher stated that the concept of environment can be defined in different ways. This relates with the research that was conducted by the Department of Environmental Affairs and Tourism [DEAT] (2004) which indicated that the concept of environment is widely used and has a broad range of definitions, interpretations and meanings. The teacher mentioned that environment is based on the surroundings where we stay, which is also a situation whereby there is life and even where there is no life. This statement relates with the DEAT (2004) which defined the concept of environment as surroundings in which humans and other organisms exist. For that reason, it was evident that the teacher had adequate knowledge about the concept of environment.

The teacher had a correct conceptualisation of what environmental education is. He mentioned that environmental education is about being educated by your surroundings, being taught on how to take care of the environment and having skills to see the problems that affect your surroundings so that you can find ways on how to solve them. This relates to a study that was conducted by Zafar (2018) who defined environmental education as a holistic procedure that is aimed at creating responsible individuals who are able to identify environmental problems, engage themselves in problem-solving and take action towards protecting the environment. The teacher showed insufficient knowledge about the concept of "integration" as he mentioned that it refers to

taking different subjects and looking for what is common between them. His statement was broad, as much as he did not manage to illustrate the concept itself.

Prior-knowledge has long been measured as the most important factor that has an impact in teaching and learning (Hailikari et al., 2007). These important considerations were partially evident in the lessons that were presented by the teacher. Prior-knowledge was administered when he taught about recycling but that did not materialise as it was difficult for learners to connect the new content to what they already knew.

The insufficiency of a teacher in content knowledge is regarded as a main cause of misconceptions (Cakir & Crawford, 2001). Based on the research findings, it was evident that the teacher had a wrong conceptualisation of the integration of environmental education in teaching and learning. He was of the opinion that only some school subjects have content on how to take care of the environment, which was a misconception. The integration of environmental education is referred to as a cross-curricular phase organiser which needs all teachers in all learning areas to consider an environmental focus (DBE, 1997). Environmental education content is integrated in all subjects and levels of the schooling system which is Grade R to Grade 12 (CAPS, 2011).

Thus being said, it is clear that environmental education is integrated across all subjects. The teacher is of the opinion that environmental education can only be integrated through practical assessments which is also misconception. However, Lewin (2014) indicates that there are teaching strategies that teachers can use to integrate environmental education such as using action projects, case studies, debate, demonstration, discovery demonstration, discussions, experience, games and inviting guest speakers.

Furthermore, the teacher had misconceptions about learning environments that cater for the integration of environmental education. Thus Vermetten et al., (2002) suggest that learning environments should be functional and correspond as closely as possible to the situations in which teaching and

learning is applied so that it encourages activity and engages learners in an interactive way.

B. Instructional strategies

Instructional strategies are techniques that are used by teachers in order to monitor and assess teaching and learning so that they can accomplish tasks effectively (Alberta learning, 2002). In the course of the post-observation interview that was conducted with the teacher, he stated that the instructional strategies that he uses will mainly depend on the given scenario. He indicated that he can use question and answer method and jigsaw methods to integrate environmental education.

Question and answer method is the most important technique that the teacher can use in most teaching and learning situations (Rossouw, 2012). Over the course of the post-observation interview, the teacher illustrated that he can use this method by asking learners questions and they will answer. This was evident in the classroom situation as this method was infused during lesson presentation of the topic on recycling. The teacher asked questions about recycling that transformed learners from being listeners into active participants throughout the lesson. This method stimulated discussions that allowed the teacher to raise awareness and sensitivity as well as engage in problem-solving so that they can take action towards environmental issues that can be overcome through the process of recycling.

The teacher also used outdoor teaching method. Outdoor teaching method is a method of teaching that makes the use of natural and built areas (Woodhouse et al., 2000). This method was used during the practical assessment of separating ink by chromatography, whereby the teacher took learners outside the classroom environment to form groups of 8-10 members so that they can complete the given task. The implementation of this method was beneficial to the teacher. Most learners who were not actively involved in the classroom appeared to behave differently in that they were fully engaged

in activities and instructions that were initiated by the teacher in the outdoor environment (Maynard, 2013).

The researcher noticed the use of Student Team's Achievement Division (STAD) method during teaching and learning that took place in an outdoor environment. This method was not used effectively as there were many mistakes in it. The teacher instructed learners to group themselves into groups of 8-10 members, however this does not correlate with student team's achievement division method which was developed by Slavin (1994). In student team's achievement divisions, learners must be divided into four or five members per learning team (Slavin, 1994). Therefore, it was evident that the teacher had inadequate knowledge about the implementation of the student team's achievement division method.

Discussion method was applied by the teacher when he presented a lesson on careers in chemistry, mining and waste management. A discussion method is considered as an imperative teaching method in all disciplines of teaching and learning as it assists learners to process information rather than merely receiving it (Cashin, 2011). The teacher used this method by ensuring that he involved as many learners as possible, especially on issues that can assist them to develop a deeper understanding of environmental issues and have skills to make informed decisions, which in this context was based on waste management and recycling topics. This method contributed in a positive way throughout the lessons that were presented by the teacher.

Textbook method was also infused. A textbook method is considered as an important teaching and learning resource as it is embedded with a curriculum itself (DBE, 2015). The teacher used this method by combining it with other methods such as question and answer method. This method was applied when he taught about recycling and careers in chemistry, mining and waste management. However, the application of this method had its own limitations because not every learner had a textbook in their possession. Thus being said, it was evident during lesson observations that those who did not have

textbooks were not focused in class and they were dependent upon the teacher.

In conclusion, the teacher mentioned that he can use jigsaw method to integrate environmental education effectively. He mentioned that he would employ this method by calling learners alphabetically through looking at their names, thereafter they answer according to a sequence of assigned numbers. The teacher had a wrong conceptualisation of the jigsaw method and how to implement it. The teacher mentioned that he would call learners alphabetically, however Arends (1991) stated that learners should be the ones to select topics for the study, do and in-depth investigation of the chosen topic and then prepare and present their findings to the whole class. Thus being said, it is quite clear that the teacher needs more intervention on instructional strategies as it was evident from the above-mentioned findings that he had inadequate knowledge about these strategies which is capable of impeding the process of integrating environmental education effectively.

D. Challenges and opportunities

During lesson observations and the interviews that were conducted it was evident that the teacher encountered a lot of challenges when he had to integrate environmental education. The teacher mentioned that a lack of learning materials is one of the challenges that he experienced when he had to integrate environmental education. This relates to the study that was conducted by Letselela (2003) who found that teachers were challenged by access to resources, which in this regard is learning support materials, which made it difficult to integrate environmental education.

The most alarming factor is that the research that was conducted by Kim and Fortner (2006) also revealed that limited course handbooks, materials and training on environmental education were the major constraints that developed challenges. The teacher also encountered challenges with the issue of not having seniors. This relates with Rahman et al., (2018) who indicate that a lack of support from the school administrators and relevant stakeholders are one of

the contributing factors that leads to challenges that impedes the integration of effective environmental education.

In addition, an inadequate school environment and lack of apparatus served as constraints that hindered the teacher in integrating environmental education in teaching and learning. School classrooms, buildings, laboratories and equipment are considered to be the most important elements of learning environments in schools, as they are able to enhance better instruction and improve learning outcomes (Teixeira et al., 2017). Thus being said, it is important to acknowledge that the school environment is capable of affecting learning through three inter-related factors such as stimulation, naturalness and the flexibility of learning environment (Barrett et al., 2013). Thus being said, it was quite clear that the lack of access to teaching and learning materials has been an on-going challenge that seems to be the most contributing factor that impedes the integration of environmental education. These constraints have a negative impact on environmental education as it cannot be integrated effectively (Rahman et al., 2018).

The integration of environmental education provides opportunities to enhance skills that are needed by teachers so that they are able to use different approaches to develop environmental awareness, understanding of environmental problems and engage in problem-solving (Abboud, 2018). The teacher mentioned that he integrates environmental education in teaching by taking whatever they are experiencing outside into a classroom situation. This relates with Campbell (2014) who indicates that environmental education provides important opportunities for teachers and learners to become engaged in real world issues that go beyond classroom walls. However, it is important to acknowledge that environmental education can be integrated formally and informally in schools, classrooms or in an outdoor learning environment (Abbound, 2018). In conclusion, the teacher highlighted that it is important to integrate environmental education so that one can be aware of environmental issues.

4.5. SUMMARY

This chapter presented, discussed and made findings from the data that was collected of the three cases that were identified in order to answer the research questions of this study. All interviews that were conducted with the participants used the same pre-observation and post-observation interview questions. Additionally, all three participants were observed separately in order to develop more understanding on how they integrate environmental education in teaching and learning situation. The elements that are presented above are the ones that assisted in answering all of the research questions in this study. Chapter five will discuss the summary of findings, recommendations and conclusions of this study.

CHAPTER 5
SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSION

5.1. INTRODUCTION

This chapter presents the summary of the findings about the integration of environmental education by senior phase teachers in some schools of Nkangala district. The research question and sub-questions are answered in this chapter.

5.2. RESEARCH QUESTION AND SUB-QUESTIONS

This study was conducted in order to explore how senior phase teachers integrate environmental education in their teaching and learning. The focus was on the teacher knowledge about the integration of environmental education, instructional strategies and challenges and opportunities of integrating environmental education.

The study was guided by the following research question:

1. How do senior phase teachers integrate environmental education in their teaching and learning?

The question led to the following sub-questions:

a. What is the nature of the teachers' environmental education knowledge?
b. What teaching strategies do teachers use when integrating environmental learning in the teaching and learning process (if they integrate environmental education)?
c. What challenges and opportunities do teachers have when integrating environmental education?
d. What challenges do teachers have when they are not integrating environmental education?

5.2.1. What is the nature of the teachers' environmental education knowledge?

Case 1: Mrs Makhamba

The study found out that the teacher had inadequate knowledge about the environment. This was noticed when she explained environment as a surrounding, which in this regard was very broad. She had a clearer understanding about the concept of integration, she said integration is about combining things. The teacher had an incorrect perception of what environmental education integration is, as she said that when you integrate environmental education you must always make sure that your learners are outside checking the environment, which in this context was a misconception.

Case 2: Mr Mabhenisa

The study found that the teacher had adequate knowledge about the environment and integration concepts. He said that environment refers to the nature that we live in which caters for all the living and non-living species that are found in the environment. He indicated that integration is about accommodating different types of things that are found in an environment and linking them to living and non-living things. The teacher had adequate knowledge about environmental education. He described environmental education as a process of giving people knowledge about the environment in which they live. The teacher had inadequate knowledge about the integration of environmental education, as he said that the integration of environmental education can only be integrated through practical education and school excursions, which is a misconception.

Case 3: Mr Mphophotho

The study revealed that the teacher had adequate knowledge about the environment, as he described environment as the surroundings whereby there is life and even where there is no life. However, the teacher showed inadequate knowledge about the concept of integration, as he said integration is about taking different subjects and looking for what is common in them. The study revealed that

the teacher had a correct conceptualisation of what environmental education is, as the teacher asserted that it is about being educated by your surroundings, being taught about how to take care of the environment and having skills to see the problems that affect your surroundings so that you can find ways in which to solve them.

5.2.2 What teaching strategies do teachers use when integrating environmental learning in the teaching and learning process (if they integrate environmental education)?

Case 1: Mrs Makhamba

The study found that the teacher used teaching methods such as narrative method, interactive method, question and answer method and outdoor method. However, there were only two teaching strategies that enabled the integration environmental education to take place which are interactive teaching method and outdoor learning method. When she used interactive teaching, she was able to relate the content of abuse to real life situations that affect individuals and the environment as a whole which encouraged interaction and discussions between the teacher and the learners. The teacher also applied hands-on learning strategies during outdoor learning during the physical education and training lesson where she taught about the importance of exercising in an environment that is not harmful.

Case 2: Mr Mabhenisa

The study revealed that the teacher used teaching methods such as lecture method, question and answer method, interactive method and project method. However, the only teaching strategies that enabled the teacher to integrate environmental education effectively was the question and answer method. The teacher used critical thinking skills towards the resolution of environmental issues that can be created by cell phone towers as a key objective of environmental education.

Case 3: Mr Mphophotho

The study revealed that the teacher used question and answer method, jigsaw method, outdoor teaching method, student team’s achievement division method,

discussion method and textbook method. However, it was question and answer method, outdoor teaching method and discussion method that enabled the integration of environmental education in the teaching and learning process. The question and answer method stimulated discussions that allowed the teacher to raise awareness and sensitivity and engage in problem-solving so that one can be able to take action towards the environmental issues that can be overcome through the process of recycling. The outdoor teaching method enabled the teacher to use a different learning environment when conducting a chromatography project. The discussion method was used to involve as many learners as possible, especially on issues that can assist them to develop a deeper understanding of environmental issues and develop the skills to make informed decisions, which in this context was based on waste management and recycling topics.

5.2.3 What challenges and opportunities do teachers have when integrating environmental education?

Case 1: Mrs Makhamba

The study revealed that the teacher experienced many challenges when she had to integrate environmental education. Those challenges were that, there is not enough time for one to integrate environmental education effectively and there are over-crowded classrooms which make it difficult for the teacher to integrate environmental education. The opportunity regarding over-crowded classrooms was that the teacher suggested that if she could have a manageable classroom size, she would be able to integrate environmental education effectively. However, it was observed that the teacher was not even aware that it is possible to integrate environmental education in an over-crowded classroom like she did when she taught about abuse. The content of abuse provided her with an opportunity to integrate environmental education as she was able to raise awareness about real life situations that affect individuals and the environment as a whole.

Case 2: Mr Mabhenisa

The study revealed that the challenge that the teacher experienced when he integrates environmental education was a lack of learning materials. The teacher did not have learning materials that could have contributed effectively in building a cell phone tower project which was embedded with a lot of environmental aspects. However, the use of textbook method resulted in an opportunity which allowed him to integrate environmental education. This was an opportunity as he managed to relate the topic of recycling to real life situations which enhanced knowledge, understanding and raised awareness about how to sustain the environment and combat environmental issues.

Case 3: Mr Mphophotho

The study revealed that the challenges that the teacher experienced when he had to integrate environmental education were a lack of enough materials to use in class and the school environment. However, the opportunity was that the teacher effectively used different learning environments such as an outdoor learning environment in order to enhance better understanding when conducting a chromatography project.

5.2.4 What challenges do teachers have when they are not integrating environmental education?

Case 1: Mrs Makhamba

The study revealed that the teacher does not integrate environmental education often. The contributing factor to this challenge is that teacher had misconceptions about the integration of environmental education in teaching and learning. The teacher indicated that she does not integrate environmental education often, she only integrates it sometimes depending on the topic that she teaches at that present moment. The teacher was not aware that environmental education is integrated across the curriculum.

Case 2: Mr Mabhenisa

The study revealed that the teacher does not integrate environmental education effectively across the curriculum due to some misconceptions that he had which contributes towards the challenges of environmental education integration. The teacher said that environmental education can only be integrated through practical education and school excursions. This contributes towards the challenges because the teacher was not aware that there are other teaching methods that he can use to integrate environmental education effectively.

Case 3: Mr Mphophotho

The study revealed that the teacher does not integrate environmental education effectively because he indicated that environmental education can only be integrated in some school subjects and through practical assessment. This contributes towards the challenges because it proves that the teacher does not integrate environmental education effectively. Furthermore, it showed that the teacher is not aware that environmental education is integrated across all subjects and that there are other strategies that can be used other than practical assessment.

5.2.5 How do senior phase teachers integrate environmental education in their teaching and learning?

Case 1: Mrs Makhamba

The teacher does not integrate environmental education often. She did not understand what environmental education is and the integration of environmental education due to the misconceptions that she has developed. She used instructional strategies such as narrative method which did not enhance the integration of environmental education effectively. However, she had an opportunity to integrate environmental education even though she was not aware of it. In this regard she used interactive method and question and answer. The over-crowded classes and time constraints were some of the challenges that impeded the integration of environmental education.

Case 2: Mr Mabhenisa

The teacher does not integrate environment education effectively across the curriculum even though he had correct conceptualisation of what environmental education is. He used instructional strategies such as question and answer method which enhanced the integration of environmental education. However, his instructional strategies such as lecture method, project method and interactive methods did not enhance the integration of environmental education. A lack of learning materials was a contributing factor to challenges that impeded the integration of environmental education. However, a textbook method resulted in an opportunity which enabled him to integrate environmental education in some of the content he taught.

Case 3: Mr Mphophotho

The teacher does not integrate environmental education effectively as he is not aware that it is integrated across all subjects. Instructional strategies such as jigsaw method, student team's achievement division method and textbook method did not enhance the integration of environmental education. However, instructional strategies such as question and answer method, outdoor teaching method and discussion method did enhance the integration of environmental education. Challenges such as a lack of teaching and learning materials were a contributing factor that impeded integration of environmental education. However, using a different learning environment did enhance the integration of environmental education.

5.3. MAIN CONTRIBUTIONS TO THE STUDY

Recent studies were conducted about environmental education. However, they focused more on secondary school and the impact of environmental education on learners. For instance, Msezane (2014) conducted a study that focused on the exploration of the impact of environmental education innovation on students in sustaining land resources. Additionally, Velempini's (2017) study focused on the

integration of environmental education in the secondary school curriculum. This study has shown how teachers in the senior phase integrate environmental education in teaching and learning. It has shown that teachers have inadequate knowledge as they have many misconceptions about environmental education.

It has shown that teachers use instructional strategies such as narrative method, lecture method, project method, jigsaw method, textbook method and student team's achievement division method, which hindered the integration of environmental education. However, other instructional strategies that they used were interactive method, outdoor learning method, question and answer method and discussion teaching method, which enabled them to integrate environmental education even though they were not aware that they were integrating environmental education in some of the lessons. This study has shown that teaching strategies that teachers used had an impact on how they integrate environmental education and that contributed to challenges. Furthermore, the study revealed that teachers were challenged by time constraints, over-crowded classrooms, instructional strategies that they used and a lack of teaching and learning materials. In conclusion, this study has shown that teachers do not integrate environmental education effectively and across the curriculum.

5.4 SHORTCOMINGS OF THE STUDY

This section presents the shortcomings of the study:

- The study was only conducted with three teachers who teach Natural Sciences, Technology and Life Orientation subjects in Grade 7 but there was an in-depth analysis of each of these cases.
- The study focused on one school and in that regard the researcher could not have known what the findings would be if the study was conducted in a larger number of schools, but it would be interesting for the study of this nature to be conducted in a higher number of schools in future.

- The study was a case study and the findings cannot be generalised to other teachers, but the findings can provide an insight for future studies into how teachers integrate environmental education.

5.5. RECOMMENDATIONS

This section presents the recommendations:

- Teachers do not have adequate knowledge about the concepts of environmental education which led to them developing misconceptions about environment, integration, environmental education and the integration of environmental education. Therefore, it is recommended that during training workshops these aspects must be clarified and clearly defined so that they can acquire adequate knowledge and skills towards the integration of environmental education as stipulated in the curriculum.
- The study showed that teachers used different types of instructional strategies however some of these strategies hinder the integration of environmental education. Therefore, it is recommended that teachers should come up with approaches that they can use to improve their instructional strategies to enable the integration of environmental education.
- Teachers encountered challenges such as a lack of learning materials when they have to integrate environmental education. Therefore, it is recommended that the Department of Education should provide them with adequate teaching and learning materials needed so that they can be provided with opportunities to integrate environmental education.
- Teachers do not integrate environmental education adequately and across the curriculum. Therefore, it is recommended that the school, together with teachers, should introduce continuous environmental education programmes or competitions that cater to the curriculum, as this might assist teachers and learners to be aware of the importance of sustaining the environment and acquiring knowledge and skills on sustainable development practices.

5.6. FURTHER STUDY

- This study was conducted in one school which it was a senior phase school. Therefore, it is recommended that future studies can be carried out in Foundation phases and Further Education and Training Phases (FET) whereby it will include a number of schools, circuits, districts or expanded provincially.

5.7 CONCLUSION

This study about the integration of environmental education by senior phase teachers in the Nkangala District was successful as the researcher was able to achieve the aims and objectives of the study. The research findings indicated that environmental education is not integrated effectively in the teaching and learning process. It was evident that teachers who integrate and those that do not integrate environmental education encountered challenges even though there were opportunities of integrating environmental education. The results showed that the inadequate knowledge that teachers have about environmental education had a huge impact on how they integrate environmental education, taking into consideration the teaching strategies that they use.

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APPENDICES
APPENDIX A: UNISA ETHICS CLEARANCE CERTIFICATE

UNISA university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2019/03/13

Ref: **2019/03/13/51994186/07/MC**
Name: Miss L Sikhosana
Student: 51994186

Dear Miss Sikhosana

Decision: Ethics Approval from 2019/03/13 to 2022/03/13

Researcher(s): Name: Miss L Sikhosana
E-mail address: 51994186@mylife.unisa.ac.za
Telephone: +27 71 874 2016

Supervisor(s): Name: Prof AV Mudau
E-mail address: mudauav@unisa.ac.za
Telephone: +27 12 429 6353

Title of research:

Integration of environmental education by senior phase teachers in some schools of Nkangala District.

Qualification: M. Ed in Science & Technology Education

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2019/03/13 to 2022/03/13.

*The **low risk** application was reviewed by the Ethics Review Committee on 2019/03/13 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

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2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
7. No field work activities may continue after the expiry date **2022/03/13**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2019/03/13/51994186/07/MC** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Kind regards,

Prof AT Motlhabane
CHAIRPERSON: CEDU RERC
motlhat@unisa.ac.za

pp **Prof V McKay**
EXECUTIVE DEAN
Mckayvi@unisa.ac.za

APPENDIX B:

LETTER TO REQUEST PERMISSION FROM MPUMALANGA DEPARTMENT OF EDUCATION (NKANGALA DISTRICT)

UNISA college of education

UNISA COLLEGE OF EDUCATION
DEPARTMENT OF SCIENCE AND TECHNOLOGY EDUCATION
REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT NKANGALA DISTRICT

Research tittle: Integration of environmental education by senior phase teachers in some schools of Nkangala district.

Date: 11 April 2019

The District director

Nkangala district

Mpumalanga department of education

Dear Sir/Madam

I, Lettah Sikhosana am doing research under supervision of Prof. AV Mudau a Professor in the Department of Science and Technology Education, towards a Master of Education in Environmental Education at the University of South Africa. We are inviting you to participate in a study entitled Integration of environmental education by senior phase teachers in some schools of Nkangala district.

The main aim of the study is to explore how and why senior phase teachers integrate or not integrate environmental education.

Your district has been selected because the aim of the study is to explore the integration of environmental education by teachers in senior phase schools in Nkangala district and this can be achieved in your district.

The study will entail observations and interviews that teachers will participate on. Participation in this study is strictly voluntary hence every participant is allowed to discontinue their engagement should they feel uncomfortable. The teachers will be requested to sign the consent forms and give permission before the observations and interviews can take place. The researcher will explain the research process to ensure that teachers are aware of what is expected from them.

This study will be beneficial to the educational community as it will enable teachers to formulate and merge strategies that they can implement to ensure that they develop a greater understanding of environmental education in a way that they come up with skills and problem solving techniques to make informed, educated decisions to ensure sustainable development. Environmental education failures will be addressed in the teaching and learning process. Teachers will acquire adequate knowledge about environmental education and how to integrate it.

The challenges and opportunities that teachers face in integrating environmental education in teaching and learning will be addressed as they will be aware of such challenges and use their problem solving skills to solve them.

UNISA college of education

The names of the schools and teachers who will participate in this study will be kept confidential. All data collected in the study will be used for the purpose of this study only.

There are no potential risks in the study.

There will be no reimbursement or any incentives for participation in the research.

Feedback of the study will be limited to participants who request them.

For enquiries please contact me on:

Cellphone number: 060 912 5250 or 071 874 2016

Email: lettahsikhosana@gmail.com

Or my supervisor: Prof. AV Mudau

Telephone number: 012 429 6353

Email: mudauav@unisa.ac.za

Yours sincerely

SIKHOSANA L

Lettah Sikhosana

Researcher

APPENDIX C
MPUMALANGA DEPARTMENT OF EDUCATION (NKANGALA DISTRICT)
APPROVAL LETTER

education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

Building No. 5, Government Boulevard, Riverside Park, Mpumalanga Province
Private Bag X11341, Mbombela, 1200.
Tel: 013 766 5552/5115, Toll Free Line: 0800 203 116

Litiko le Temfundvo, Umnyango we Fundo | Departement van Onderwys | Ndzawulo ya Dyondzo

Enquiries : SM Kabini
Tel : 013 947 1745
Email : s.kabini@education.mpu.gov.za

Ms. L Sikhosana
P O Box 911-283
Rosslyn
0200

Dear Ms. L Sikhosana

REQUEST FOR PERMISSION TO CONDUCT A RESEARCH STUDY AT SELECTED SCHOOLS IN NKANGALA DISTRICT.

We hereby acknowledged receipt of your letter dated 24 April 2019.

Permission is hereby granted on the following conditions:

- That you first arrange with the school before the actual visit.
- That teaching and learning is not disrupted.

We wish you well in your research.

Thank you.

MR. DM MAJA
DISTRICT DIRECTOR

29/04/2019
DATE

MPUMALANGA
THE PLACE OF THE RISING SUN

APPENDIX D
LETTER TO REQUEST PERMISSION FROM THE SELECTED SCHOOL

UNISA college of education

UNISA COLLEGE OF EDUCATION
DEPARTMENT OF SCIENCE AND TECHNOLOGY EDUCATION
REQUEST LETTER TO PARTICIPANTS (TEACHERS)

Date: 11 April 2019

Title: Integration of environmental education by senior phase teachers in some schools of Nkangala district.

DEAR PROSPECTIVE PARTICIPANT

My name is Lettah Sikhosana I am doing research under the supervision of A V Mudau a professor in the Department of Science and Technology, towards a Master of Education in Environmental Education at the University of South Africa. We are inviting you to participate in a study entitled Integration of environmental education by senior phase teachers in some schools of Nkangala district.

This study is expected to collect important information that could be beneficial to the educational community as it will enable teachers to formulate and merge strategies that they can implement to ensure that they develop a greater understanding of environmental education in a way that they come up with skills and problem solving techniques to make informed, educated decisions to ensure sustainable development. Environmental education failures will be addressed in the teaching and learning process. Teachers will acquire adequate knowledge about environmental education and how to integrate it. The challenges and opportunities that teachers face in integrating environmental education in teaching and learning will be addressed as they will be aware of such challenges and use their problem solving skills to solve them.

You are invited because of the important role that you play as a teacher towards ensuring that sustainable education is imparted in the process of teaching and learning. Please note that six participants have been selected for this study.

The study involves audio taping, semi-structured interviews and observations. The first interview will be conducted before you present your lesson, followed by an observation

during your lesson presentation and conclude with a post observation interview which will be conducted after the lesson presentation. All Interviews conducted, will last for approximately 30 minutes.

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent adult form. You are free to withdraw at any time and without giving a reason. All information that you provided in the study, will remain highly confidential and anonymous.

1

This study is expected to benefit teachers towards formulating and merging strategies that they can use to ensure that they develop a greater understanding of environmental education in a way that they come up with skills and problem solving techniques to make informed, educated decisions to ensure sustainable development. It will also address the challenges and opportunities that teachers face in integrating environmental education in teaching and learning will be addressed as they will be aware of such challenges and use their problem solving skills to solve them.

The research involves the day-to-day activities of the participants. Therefore, there are no negative consequences for participating in this research study.
You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know about your involvement in this research **OR** Your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers will be given a code number or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

Your answers may be revised by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Review Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

UNISA college of education

All information gathered in this study, will remain anonymous and cannot be traced to your name

While every effort will be made by the researcher to ensure that you will not be connected to the information that you share during the focus group, I cannot guarantee that other participants in the focus group will treat information confidentially. I shall, however, encourage all participants to do so. For this reason, I advise you not to disclose personally sensitive information in the focus group.

All information gathered in this study, will remain anonymous and cannot be traced to your name.

Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filing cabinet and stored with my supervisor in my institution for future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable.

After such time, all hard copies will be shredded and electronic copies will be permanently deleted from the hard drive of the computer through the use of a relevant software programme.

2

No payment will be given to any participants.

This study has received written approval from the Research Ethics Review Committee of the Research Ethics Review Committee of Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

If you would like to be informed of the final research findings, please contact Lettah Sikhosana on:

060 912 5250 or 071 874 2016

Email lettahsikhosana@gmail.com

UNISA college of education

Should you have concerns about the way in which the research has been conducted, you may contact my supervisor:

Prof. AV Mudau on: 012 429 6353

Email: mudauav@unisa.ac.za

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

Yours Sincerely

SIKHOSANA L

Lettah Sikhosana

Researcher

APPENDIX E

APPROVAL LETTER FROM THE SELECTED SCHOOL

KHANYA SENIOR phase school

PO Box 3106
Empumalanga
0458

Stand 1
Mpu

To

Ref. Number: 8
Enquiries: Ma
Contact No: 0

RE: Approval to be allowed to conduct a research in the school.

Student Name: Miss L. Sikhosana
Student Number: 51994186
Qualification: M. Ed in Science & Technology Education

Title of research: Integration of environmental education by senior phase teachers in some school of Nkangala District

To: Unisa College of Education Ethics Review Committee

This letter serves to confirm that the above mentioned school has given permission to Miss L. Sikhosana to conduct a research in her study as indicated above. Furthermore the school allows her to interact with the targeted participants as per her request for the duration of the project.

Signature: _____ **Date:** 06/05/2019
Principal

School Stamp

SENIO... SCHOOL
06 -05- 2019

APPENDIX F
REQUEST LETTER TO PROSPECTIVE PARTICIPANTS

UNISA college of education

UNISA COLLEGE OF EDUCATION
DEPARTMENT OF SCIENCE AND TECHNOLOGY EDUCATION
REQUEST LETTER TO PARTICIPANTS (TEACHERS)

Date: 11 April 2019

Title: Integration of environmental education by senior phase teachers in some schools of Nkangala district.

DEAR PROSPECTIVE PARTICIPANT

My name is Lettah Sikhosana I am doing research under the supervision of A V Mudau a professor in the Department of Science and Technology, towards a Master of Education in Environmental Education at the University of South Africa. We are inviting you to participate in a study entitled Integration of environmental education by senior phase teachers in some schools of Nkangala district.

This study is expected to collect important information that could be beneficial to the educational community as it will enable teachers to formulate and merge strategies that they can implement to ensure that they develop a greater understanding of environmental education in a way that they come up with skills and problem solving techniques to make informed, educated decisions to ensure sustainable development. Environmental education failures will be addressed in the teaching and learning process. Teachers will acquire adequate knowledge about environmental education and how to integrate it. The challenges and opportunities that teachers face in integrating environmental education in teaching and learning will be addressed as they will be aware of such challenges and use their problem solving skills to solve them.

You are invited because of the important role that you play as a teacher towards ensuring that sustainable education is imparted in the process of teaching and learning. Please note that six participants have been selected for this study.

The study involves audio taping, semi-structured interviews and observations. The first interview will be conducted before you present your lesson, followed by an observation

during your lesson presentation and conclude with a post observation interview which will be conducted after the lesson presentation. All Interviews conducted, will last for approximately 30 minutes.

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent adult form. You are free to withdraw at any time and without giving a reason. All information that you provided in the study, will remain highly confidential and anonymous.

This study is expected to benefit teachers towards formulating and merging strategies that they can use to ensure that they develop a greater understanding of environmental education in a way that they come up with skills and problem solving techniques to make informed, educated decisions to ensure sustainable development. It will also address the challenges and opportunities that teachers face in integrating environmental education in teaching and learning will be addressed as they will be aware of such challenges and use their problem solving skills to solve them.

The research involves the day-to-day activities of the participants. Therefore, there are no negative consequences for participating in this research study.
You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know about your involvement in this research **OR** Your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers will be given a code number or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

Your answers may be revised by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Review Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

UNISA college of education

All information gathered in this study, will remain anonymous and cannot be traced to your name

While every effort will be made by the researcher to ensure that you will not be connected to the information that you share during the focus group, I cannot guarantee that other participants in the focus group will treat information confidentially. I shall, however, encourage all participants to do so. For this reason, I advise you not to disclose personally sensitive information in the focus group.

All information gathered in this study, will remain anonymous and cannot be traced to your name.

Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filing cabinet and stored with my supervisor in my institution for future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable.

After such time, all hard copies will be shredded and electronic copies will be permanently deleted from the hard drive of the computer through the use of a relevant software programme.

No payment will be given to any participants.

This study has received written approval from the Research Ethics Review Committee of the Research Ethics Review Committee of Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

2

If you would like to be informed of the final research findings, please contact Lettah Sikhosana on:

060 912 5250 or 071 874 2016

Email lettahsikhosana@gmail.com

UNISA college of education

Should you have concerns about the way in which the research has been conducted, you may contact my supervisor:

Prof. AV Mudau on: 012 429 6353

Email: mudauav@unisa.ac.za

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

Yours Sincerely

SIKHOSANA L

Lettah Sikhosana

Researcher

APPENDIX G:
CONSENT FORM TO PARTICIPATE IN THIS STUDY (RETURN SLIP)

UNISA college of education

UNISA COLLEGE OF EDUCATION
DEPARTMENT OF SCIENCE AND TECHNOLOGY EDUCATION
CONSENT FORM TO PARTICIPATE IN THIS STUDY (RETURN SLIP)

MRS MAKHAMBA (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the observation, interviews and questionnaire.

2

I have received a signed copy of the informed consent agreement.

Participant Name & Surname: MRS MAKHAMBA

Participant Signature

Date: 02/05/2019.

Researcher's Name & Surname (please print): Lettah Sikhosana

UNISA college of education

UNISA COLLEGE OF EDUCATION
DEPARTMENT OF SCIENCE AND TECHNOLOGY EDUCATION
CONSENT FORM TO PARTICIPATE IN THIS STUDY (RETURN SLIP)

I MR MABHENISA (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the observation, interviews and questionnaire.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname MR MABHENISA

Participant Signature 02.05.2019 Date

Researcher's Name & Surname (please print): Lettah Sikhosana

3

UNISA college of education

UNISA COLLEGE OF EDUCATION
DEPARTMENT OF SCIENCE AND TECHNOLOGY EDUCATION
CONSENT FORM TO PARTICIPATE IN THIS STUDY (RETURN SLIP)

I, **MR MPHOPHOTHO** (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the observation, interviews and questionnaire.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname: **MR MPHOPHOTHO**

Participant Signature

Date: 11-04-2019

Researcher's Name & Surname (please print): Lettah Sikhosana

APPENDIX F
INTERVIEW SCHEDULE

EDUCATIONAL BACKGROUND AND TEACHING EXPERIENCE

1. Please tell me about your educational background, where did you study and for how many years?
2. How long have you been teaching?
3. How long have you been teaching the subject that you are currently teaching?

ENVIRONMENTAL EDUCATION KNOWLEGDE AND INSTRUCTIONAL STRATEGIES.

INTERVIEW QUESTIONS:

1. What is environment according to you?
2. How can you explain the word “integrate”?
3. What do you understand by “environmental education”?
4. Do you integrate environmental education during teaching and learning process?
5. If yes, how do you do that? If no, why are you not integrating it?
6. What teaching strategies do you use when integrating environmental education?
7. What are the opportunities of integrating environmental education?
8. What challenges do you experience when you integrate environmental education?
9. How do you address the abovementioned challenges, if not why?
10. What misconceptions do you know that are associated with the integration of environmental education in teaching and learning?
11. Do you think it is important for you to integrate environmental education?

POST OBSERVATION INTERVIEW QUESTIONS:

Some of the post interviews questions will be compiled during and after the conducting observations. However, the researcher has compiled some of the questions below that will form part of the post observation interview questions.

1. Did you enjoy presenting your lesson today?
2. Which part of your lesson presentation did you enjoy the most?
3. What challenges did you encounter during the lesson?
4. How well did you integrate environment education in your lesson?
5. Which teaching strategy did you use during the presentation of your lesson?

APPENDIX G
LESSON OBSERVATION SCHEDULE

ASPECTS TO BE OBSERVED DURING LESSON OBSERVATIONS OF THE THREE PARTICIPANTS

1. TEACHER KNOWLEDGE

1.1 Environmental education knowledge

……

1.2 Length of the period

……

1.3 Use of prior knowledge

……

1.4 Misconceptions of environmental education

……

2. INSTRUCTIONAL STRATEGIES

2.1 Teaching methods/strategies used

……

2.2 Teaching and learning materials used

……

3. CHALLENGES AND OPPORTUNITIES

3.1 The challenges that they experience when they are or not integrating environmental education in teaching and learning process.

……

3.2 The opportunities of integrating environmental education in teaching and learning process.

……

APPENDIX H
INTERVIEW TRANSCRIPT (CASE 1)

INTERVIEW TRANSCRIPT OF MRS MAKHAMBA AT KHANYA SENIOR PHASE SCHOOL

PRE INTERVIEW LIFE ORIENTATION: MRS MAKHAMBA

Researcher: Good day ma'am.

Participant: Good day ma'am and how are you?

Researcher: I am fine thank you.

Participant: Okay…

Researcher: Eh before we commence with our interview, I would like to thank you for the opportunity of granting me a permission to conduct the interview.

Participant: Okay…

Researcher: So please note that whatever that we are going to talk about is private and confidential, it's just between you and me.

Participant: Okay…

Researcher: First thing first, uhm... I'm going to ask you questions about your educational background and teaching experience, the environmental education knowledge and your instructional strategies.

Participant: Okay…

Researcher: So we can start…are you ready?

Participant: Yah I'm ready.

Researcher: Okay thank you. Can you please tell me about your educational background, where did you study and for how many years?

Participant: Okay I studied at Ndebele college education, my secondary teacher's diploma for the period of three years then after three years I went on and studied educational management at tut which was my first degree then I went on again and studied… I Bed at TUT which was also my educational management. Yah

Researcher: Okay Thank you ma'am and how long have you been teaching?

Participant: Hmmm I've been teaching for the period of 24 years…

Researcher: And how long have you been teaching the subject that you are currently teaching?

Participant: Hmm… currently I'm teaching life orientation and I started teaching Life Orientation… I think it's almost 10 years now…

Researcher: 10 years?

Participant: Yah teaching the same learning area and the same class… grades.

Researcher: Okay…uhm… let's move to environmental education knowledge and instructional strategies.

Researcher: What is environment according to you?

Participant: Hmm… according to me the environment is your surrounding, the place around your area that is your environment. Your class is your environment that is how I understand it

Researcher: Okay. Then how can you explain the word "integration"?

Participant: Hmm… in simple terms to integration is to combine…

Researcher: What do you understand by "environmental education"?

Participant: Hmm… I think environmental education has to do with teaching the learner's how to look after their environment…

Researcher: Do you integrate environmental education during teaching and learning process?

Participant: Not always but sometimes I do integrate it depending on the topic that I'm teaching at the present moment. For an example, if you are teaching rights you need to integrate environmental education…

Researcher: Okay….

Participant: Yah because they have to know how take par take care of their environment.

Researcher: Since you said not always…Why is it a challenge that you are not integrating it?

Participant: I think the challenge is that, eh… the classes in most cases are over-crowded and that we don't have enough time to integrate environment because when you integrate environmental you must always make sure that your learners are always outside, checking the environment also and checking their environment their classes so that is why because of the conduciveness of the class you can't always integrate the environment even the movement is difficult in class.

Researcher: Then what teaching strategies do you use when integrating environmental education?

Participant: In most cases when I teach environmental education I… I. I… make them to be aware of their environment first to say let us check our class if our class is neat and then let us check outside if the cla… the outside environment is neat and make sure that they know that before start teaching their environment needs to be clean so that also their learning should be conducive.

Researcher: Okay then What are the opportunities of integrating environmental education?

Participant: I think opportunities are there if we can have our classes that are manageable, you can integrate it I this environmental education.

Opportunities are many, they are there, if we can just have 30 learners in class then we can just really integrate it.

Researcher: Then what challenges do you experience when you integrate environmental education?

Participant: Hmm… as I said before challenges overcrowded the classes that are overcrowded eh… also the environment, we are talking about the communities where we are working. Sometimes they don't care if there are papers around the school if they are littering, so I think that is a challenge that is there.

Researcher: Okay then how do you address the abovementioned challenges, if you do not why?

Participant: We do address it by making that the learners always pick up papers in class and also inviting the community to come and clean so that our environment the environment is right.

Researcher: Okay. Then what misconceptions do you know that are associated with the integration of environmental education in teaching and learning?

Participant: Misconception is that hmm… in most cases people think that it's not their responsibility the environment is not their responsibility. That is the misconceptions because the environment is our responsibility because if… if… it is damaged then that means everybody will be affected.

Researcher: Okay, Do you think it is important for you to integrate environmental education?

Participant: Yah I think it's important so that learners and also people from the community can understand the importance of keeping our environment clean because it's for future use.

Researcher: Alright thank you

Participant: Thank you

POST OBSERVATION INTERVIEW: LIFE ORIENTATION MRS MAKHAMBA

Researcher: Uhm… Thank you ma'am for giving me a chance to observe you. So right now we are going to move to post observation interview. So basically this interview eh… is the one we are going to do now.

Participant: Okay….

Researcher: Since we have done the pre observation interview.

Participant: Okay…

Researcher: So your first question in this this regard it says that…did you enjoy presenting your lesson today?

Participant: Yes I did (laughs).

Researcher: and which part of your lesson presentation did you enjoy the most?

Participant: Eh… part of the lesson is when the learners are interacting in a good way. Yah when they are involved in a lesson that makes me happy.

Researcher: Okay…

Participant: Yah.

Researcher: Then what challenges did you encounter during the lesson?

Participant; Un-attentive learners yah… because some of them they don't listen Yah.

Researcher: They don't listen?

Participant: Yah.

Researcher: Okay. Then how well did you integrate environment education in your lesson?

Participant: Eh… I think I did integrate it because under abuse I was talking about situations where you can find environments where you can find abuse, different types of abuse so I tried to integrate it.

Researcher: Okay

Participant: Yah

Researcher: So which teaching strategy did you use during the presentation of your lesson?

Participant: Narrative

Researcher: Alright

Researcher: Then what can you say about environmental education?

Participant: I think if we can always try to integrate it, it can be nice. The learners will learn a lot about the environment so that they will be very careful.

Researcher: Alright. Thank you so much for your time.

Participant: Okay thank you.

APPENDIX I
INTERVIEW TRANSCRIPT (CASE 2)

INTERVIEW TRANSCRIPT OF MR MABHENISA AT KHANYA SENIOR PHASE SCHOOL

PRE INTERVIEW TECHNOLOGY: MR MABHENISA

Researcher: Mr XXX, thank you so much for giving me this opportunity to conduct the interview with you. I would like to inform you that I will be recording our interview so that when I analyse your data I don't misquote you. Whatever we going to talk about, will be kept private and confidential. The first thing I am going to ask you about is your educational background and your teaching experience. Can you please tell me about your educational background; where did you study and for how many years?

Participant: I studied at XXX College for three years, and I have a senior primary teacher's diploma.

Researcher: Ok, thank you sir. How long have you been teaching?

Participant: I have been teaching for more than 25 years now.

Researcher: More than 25 years, that is great. How long have you been teaching the subject that you are currently teaching?

Participant: The education system has been chopping and changing, I have been teaching social sciences more than 15 years, and I have started teaching technology from 2016.

Researcher: We are going to move to the environmental education knowledge and the instructional strategies. The first question is, “what is environment according to you?”

Participant: Environment is nature that we live in. We refer to all the species that are found in the environment whether living or non-living.

Researcher: Thank you sir. How can you explain the word “integration”?

Participant: Integration refers to accommodating different types of things that we find in the environment, which means we need to link them to those that are living and non-living things so that we able to achieve a good habitant on the environment.

Researcher: Thank you sir. What do you understand by the word “environmental education”?

Participant: Environmental education is giving people knowledge about the environment where they live in, so that they become aware as to what is it in the environment that they must take care of and how to protect the environment where they are living in.

Researcher: Ok sir, do you integrate environmental education during your teaching and learning process?

Participant: Yes, I do, although sometimes we have a handicap of the learning material. When you request the purchasing of learning material, sometimes it is an issue. So that normally stalls a lot of things, because if we were having access to different material; other than going outside, we will be using technological equipment that will make learners to be aware of what we are talking about.

Researcher: Ok, since you saying you do integrate, how do you do that?

Participant: I try to explain to the learners, and we use the pictures that are available on the textbooks.

Researcher: What teaching strategies do you use when you integrate environmental education?

Participant: Normally we use question and answer method and I use instructional method.

Researcher: What challenges do you experience when you integrate environmental education?

Participant: Unfortunately, what we have right now is a situation whereby our learners do not converse that much in English. Therefore, you need to keep on moving from English to mother tongue most of the time.

Researcher: All right, then, how do you address the above-mentioned challenges?

Participant: I am trying to engage these learners in English; I just hope that one day I will win the course, for now it is still a mountain to climb.

Researcher: Ok sir. What are misconceptions that you know are associated with the integration of environmental education in teaching, and learning?

Participant: In most cases, learners do not believe much in the environment unless you have to teach them; and most of the learners, require that we do these things practically if possible. Whatever we deal with that is about environment, we take them to the particular place to see what we are

talking about, that could change perhaps their mind-set, and they will start loving environmental education.

Researcher: All right Sir; then do you think that it is important for you to integrate environmental education?

Participant: Yes, I think it is, because we are living on the environment, and there are many dangers that are posed by the environment that we are not aware of. In addition, even learners themselves they need to be aware about other thigs that we find in nature that are good which may be regarded as bad. Just like snakes, when we see snakes we kill them, which is the first thing we do, this results in us not liking animals and the like.

Researcher: Thank you so much sir.

POST OBSERVATION INTERVIEW: MR MABHENISA

Researcher: Sir, we went to class and we did observations; what I would like to find out from you is that, did you enjoy presenting the lesson today?

Participant: Yes, I did.

Researcher: Which part of the lesson presentation did you enjoy the most?

Participant: Especially the in social science where I was making an integration or a link between the previous lesson and the present. They responded very well. Although others were mostly quiet focusing on taking notes.

Researcher: Ok, what challenges did you encounter during your lesson today?

Participant: Is the lack of participation in some of these learners, although others are able to answer questions but most of them they usually withdraw because

they have to answer in English, that is why some of them even responded in their mother tongue and normally I do not appreciate it, because the questions in the tests will be in English.

Researcher: Then how well did you integrate environmental education in your lesson?

Participant: The lesson itself was about environment, because it was about flooding. Floods affects nature, so it erodes the soil, it destroys peoples properties, destroys the crops, they destroys even the road, everything that is affected by the flood is natural mostly.

Researcher: Ok, which teaching strategies fid you use during your presentation?

Participant: I used the lecture method and I used question and answer,

Researcher: Then, at wrapping things up, what can you say environmental education?

Participant: I think environmental education is important. We need in fact to engage learners on the environment, particularly the practical part of it, taking them out to see whatever things we are talking about on the environment. If we are talking about animals, we take them out to see those animals, if it is like that then it will be practical and enjoyable for then. When we go back to class, then they will be actively involved.

Researcher: Thank you so much sir for your time and participation, I really appreciate it.

APPENDIX J
INTERVIEW TRANSCRIPT (CASE 3)

INTERVIEW TRANSCRIPT OF MR MPHOPHOTHO AT KHANYA SENIOR PHASE SCHOOL

PRE INTERVIEW NATURAL SCIENCE: MR MPHOPHOTHO

Researcher: Good morning Mr, Thank you so much for giving me this opportunity to conduct this interview with you. I would like to inform you that whatever that we are going to discuss here will be private and confidential. Our interview will take part in two stages, the first stage will be pre interview that will take place now, and the second one will be a post observation interview that will take place after. We have only two categories; the first category is educational background and your teaching experience, as well as environmental education knowledge and instructional strategies. Before we commence, we will start with educational background. Can you please tell me more about your educational background, where did you study and for how many years?

Participant: Ok thanks, I studied at different institutions because I started as a private teacher. I started from SESSA, and then I completed my certificate, thereafter I moved to Ndebele College of Education. At Ndebele College of Education, I did a Diploma, after that I moved to Tshwane University of Technology (TUT), I studied Management in Education. I therefore registered with CN Mahlangu where I did my N3. I then registered with the University of Venda, I studied Management in Education also. I also studied Advanced Certificate in Education (ACE) in Science at the University of Free State, which I did not complete. I then started working in 1986 as a private teacher at Sizamakwethu Primary School in Siyabuswa (Ouvalsfontein, Mpumalanga). I taught there for more than 20 years. 2013 I moved to Middleburg, I was in Middelburg for two years,

and then in 2015 I came to Tweefontein where I am presently.

Researcher: Thank you so much that is great news Sir. How long have you been teaching?

Participant: It has been more than 30 years now, since 1986.

Researcher: How long have you been teaching the subject that you are currently teaching right now?

Participant: Thank you very much. The subject I am currently teaching, I have been teaching it for four years now.

Researcher: Which subject is that?

Participant: Natural Science.

Researcher: Thank you so much Mr. Now we are going to environmental education knowledge and instructional strategies. The first question is what is environment according to you?

Participant: The environment is based on the surroundings where we are staying, it depends on where you are. Now, when we talk of surroundings and the environment, we are referring to a situation whereby there is life and even where there is no life. It will depend on the approach of the topic that we are dealing with.

Researcher: Ok, thank you Mr. how can you explain the word “integration”?

Participant: Integration is to take different subjects; for example, you look for what is common in it, and whenever you are teaching that subject, you refer to

the other learning areas. For example, I can integrate science with mathematics, if I take learners outside and say let them be in groups, then I tell them to make groups of five members, it is also part of mathematics. I am integrating, I am not be teaching in digits; but I will be talking about numbers. In addition, I will be talking about numbers when I say let us go to a dumping zone to sort materials, we will also count them, by doing so, we will be integrating.

Researcher: Thank you sir. What do you understand by the word “environmental education”?

Participant: Being educated by your surroundings, for example being taught on how to take care of your environment. Having a skill to see problems that affects your surroundings and find ways on how to solve them.

Researcher: Do you integration environmental education during teaching a lesson and learning process, if yes how do you do that?

Participant: Yes, I do integrate environment with teaching, whatever we are experiencing outside, we must take it into a classroom situation. Whatever we are talking to learners, some learners might understand visual things. So now, whenever we take something on the environment outside into a classroom situation then learners understand it better.

Researcher: What teaching strategies do you use when you integrate environmental education?

Participant: About teaching strategies, it depends on the scenario. Perhaps we are talking about the environment; I can ask them what they understand about the environment, they will answer. We will then take them and go

observe outside. We will then take it into a classroom situation and then we are going to interact with learners, by asking them questions and they ask me questions; that is a strategy that I can employ. I can also employ the jigsaw methods strategies, whereby I will call them by alphabets looking at their names or I might give them numbers, thereafter they answer according to the sequence numbers or the pattern that I give them to answer.

Researcher: Thank you sir. Then what are the opportunities of integrating environmental education?

Participant: Opportunities are many, because whenever you integrate learning, the learners tend to learn and develop love of doing something at home. Let's say when the arrive at home they start to share that at school they learnt about a certain subject and then they start to focus and end up saying in future I want to be this. For example, when you talk of the environment, there is this thing of hand sorting and Chromatography, all those things they are opportunities for learners to learn and be encouraged that in future, I can do this, it is very much important to know the environmental impacts.

Researcher: What challenges do you experience when you integrate environmental education?

Participant: Challenges are always there, because when you integrate environmental education, sometimes you might not have enough material to use in class, especially those that can help learners to easily understand, sometimes you want to integrate education with the environment, but the school situation does not allow us.

Researcher: How do you address the above-mentioned challenges?

Participant: It is a very big problem that we are experiencing! Because some of them, I might not be able to address them, but with consultation, I am able to solve some of them or to address some of them. The issue of not having the relevant apparatus or seniors is one of the big challenges.

Researcher: What misconceptions do you know that are associated with the integration of environmental education in teaching and learning?

Participant: Sometimes we take things easy to say integration of environmental education issues in education they are not right, because sometimes we take the learner to dumping zones it is not nice (safe). Sometimes we tell learners that they must not play at the environment, which is not conducive. However, remember for learner to know that, we have to take them there because now they must experience and see what is said of when we talk about environmental impact; they must see it and they should be able to have an input on what they observed.

Researcher: Do you think it is important for you to integrate environmental education?

Participant: I think it is important. Because when you talk of environmental education (remember the environment is a situation whereby we live), therefore, whenever we talk about the environmental education we are looking at the different things that we come across. For example, if we talk of conducive hygiene, therefore it means we must talk about the environmental issues.

POST OBSERVATION INTERVIEW NATURAL SCIENCE: MR MPHOPHOTHO

Researcher: Good morning Sir. Right now, we are going to do a post observation interview, which takes place after I have observed. I have a few questions that I am going to ask you which are based on the lesson which you had. Did you enjoy presenting your lesson today?

Participant: Yes, I did.

Researcher: Which part of the lesson presentation did you enjoy the most?

Participant: The separation of mixtures of colour especially when I investigated the black I found that black is a secondary colour, and I found out that black is made from different colours, that was so much interesting.

Researcher: What challenges did you encounter during the lesson?

Participant: The challenges was when I interacted with the learners they do not have an idea of how we separate or how we work with chromatography and how we investigate. Then as I set my apparatus, they will understand it better.

Researcher: How well did you integrate environmental education during your lesson?

Participant: When we are talking about environment, we are wearing different clothes, and we are in the environmental situation. So now, when I look at the kids and I look at myself we are not wearing similar things, now, in chromatography, the ideas of coming to the situation whereby we were talking about integration or we were talking about the separation of colours I think it was fun for me.

Researcher: Ok sir, which teaching strategies did you use during the presentation of your lesson?

Participant: I used the question and answer method.

Researcher: What can you say about environmental education?

Participant: Environmental education is very much imperative. Because now, when we talk about the weather we talking about the environment. The weather will indicate for us which types of clothing we need to wear because they are associated with a certain situation.

Researcher: OK! Thank you so much sir for your time.

APPENDIX K
LESSON OBSERVATION (CASE 1)

LESSON OBSERVATION OF MRS MAKHAMBA AT KHANYA SENIOR PHASE SCHOOL

MRS MAKHAMBA LESSON 1 OBSERVATION: LIFE ORIENTATION

Teacher: Last time when we were together we were talking about -abuse angitjho?

Learners: Yes…

Teacher: Yah let us remind ourselves, before we can continue with another topic. Let us remind ourselves. We said what is abuse? We said what is abuse?

Learner: Treating people badly.

Teacher: Yah we said abuse is when you treat other people in a bad way

Teacher: Sathi sinama we examples we abuse…number one?

Learner: Physical abuse.

Teacher: Physical abuse and then number two?

Learner: Verbal abuse…

Teacher: Verbal abuse. Number three?

Learner: Neglect

Teacher: Neglect. Number four? (Points a learner)

Learner: Emotional abuse

Teacher: Emotional abuse. Number five? (Points a learner)

Learner: Sexual abuse

Teacher: Sexual abuse. Now let us give explanations. Alright let's make explanations. We said what is sexual abuse? Let's get explanations. We said what is sexual abuse?

(Learners raise up their hands)

Learner: When you touch a person in a bad way against his or her will.

Teacher: Yes, we said sexual abuse is when you touch a person in a bad way against his or her will. Emotional abuse? We said what is emotional abuse?

Learner: When having an anger goes too far.

Teacher: When having an anger goes too far. Verbal abuse?

Learner: Is use of words to hurt another people.

Teacher: Yes is the use of words to degrade another person. Sasesiyakhuluma ke ukuthi there are risky situations where you can find yourself being abuse. Number one?

Learner: When growing up in an abusing family.

Teacher: When growing up in an abusive family chances are might be that you can be abused.

Learner: When you are using substances.

Teacher: When you are using substances. It's either you are being abuse because you are using substances or you are abused because you are staying in an environment where substance abuse is used or you are abuse because you are around people who are using substances. Eh another situation?

Learner: Eh certain mental disorders…

Teacher: Yah certain… certain mental disorders. If you are living with people who have got mental eh certain mental disorder. Uh number three?

Learner: People who cannot control their anger

Teacher: If you live with people who cannot control their anger

Teacher: Siya ku protection. How do you protect yourself from abuse? How do you protect yourself?

Learner: By dialling the emergency number.

Teacher: Yes dialling the emergency number. What is the emergency number?

Learners: 0800055555

Teacher: Yes 0 eight thousand double five triple five. That you are going to use it, it's where you find help. How do we protect ourselves from being abused?

Learner: Don't go with strangers

Teacher: Yes don't go with strangers. Number two?

Learner: Don't put yourself in risky situation

Teacher: Don't put yourself in risky situations.

Learner: Don't meet someone from the social media in awkward place

Teacher: Yes, don't go with someone, don't go and with someone omthole ku social media in a place that is not surrounded by people. Uh huh?

Learner: Leave your contact

Teacher: Leave your contact behind when you are moving away from your family. Uh huh?

Learner: Don't go to strange places alone.

Teacher: Don't go to strange places alone. Alone ne? Make sure you go with a friend so that you are protected.

Learner: Don't meet someone from social medial in appropriate.

Teacher: Sithe thina where can we find help? Where can we find help?

Learner: Social workers

Teacher: Yes we must go to social workers. Eh huh?

Learner: SAPS

Teacher: You can use SAPS eh huh?

Learner: Pastors

Teacher: Yah we can go to pastors if we are abused at home, we can use a church, use our pastors to give us…uh huh?

Learner: Love life

Teacher: Yes we can also contact love life.

Teacher: Alright, let us move to our next chapter. I chapter yethu elandelako izokukhuluma ngama careers.

MRS MAKHAMBA LESSON 2 OBSERVATION LIFE ORIENTATION

Teacher: Alright last time besenze abuse angitjho?

Learners: Yes

Teacher: Let us say…you grow up, in an environment that is very neat for you, there is no abuse. You grow up and you become an adult with a sober mind and then you want to see yourself being employed.

Learners: Yes

Teacher: Nawukhulela endaweni e right, la kungana muntu okuhlukumeza khona uyakhula ube mkhulu angitjho, kufike iskhathi la kuzokufanele uyokuberega khona.

Learners: Yes

Teacher: That is why I said when I talk to you about I abuse I said when you grow up in a family that has got abuse, you will end up becoming an abuser yourself and it lower your self-esteem. The way you see yourself. So but if

u talk about it you go for counselling, you will end up being a better person. So, nasele sibakhulu we need to make sure we have careers esiwa tjhuzako. But before we can talk about I career, we must come up with an explanation of what a career is, so that we can understand. What is a career?

Learner: It's something that lasts for a long time.

Teacher: Okay something that lasts for a long time. Yini I career?

Learner: I career mam ngilokhu okghona ukukwenza njengama nurse so bane career.

Teacher: What is the career?

(No hands raised)

Teacher: When we explain it, we can simply say: a career is the type of work, we can say is the type of occupation that you like to do one day. One day or in a future. Now, for you to be able to choose a career, the first step that you need to do is to make sure you know yourself. That is step number one, know yourself.

Learners: Yes

Teacher: Yes, you must choose your career according to yourself, who are you? You must find out yourself, the first thing that you need to do, finding out yourself is to build your strength. Build your strength, then your strength is built by number one your personality. Number two your abilities number three your interests and number four your values. Now when you are building your strength which is your focus of your career, you need to concentrate on your personality, your ability your interests and your values.

Learners: Yes

Teacher: Let us say ufuna ukuba yi nurse, angitjho?

Learners: Yes

Teacher: Ukuba ngu nurse kufuna a certain personality So kufanele wakhe I personality yakho so that it goes in line with your career. Number two you must look at your abilities, number three your interests and number four your values. Now what is a personality?

Learners: (mumbling)

Teacher: Your personality is you, now it involves your social characteristics it involves your mentality it involves your physical appearance it involve your dislikes and likes. Your personality involves your social characteristics now your social characteristics is the way you behave where you are staying. Your social characteristics it has to do with the environment that is surrounding you. How do you conduct yourself la uhlala khona, in a community where you are, efemelini okukiyo how you conduct yourself if you are among your friends. Your social characteristics forms your personality.

Learners: Yes

Teacher: And your personality is one of the strength that you must look at when you are choosing your career.

Teacher: Number two your mentality, ingqondo. Number three your physical appearance. There are those careers that needs physical appearance. The last one is dislikes and likes. What do you like and what do you dislike that means your personality. Now let's come to number two, abilities. What are abilities?

Learners: (mumbling and no hands are raised)

Teacher: An ability? Le yona kosa niyazi, niyifundile kwa grade 4, you must know what an ability is. What are our abilities?

Learner: Are the things you can do well

Teacher: Things that you can do well. Thank you. Abilities are the things that you can do well or u can do them in simple things, terms. Abilities are the things

that you are able to do. When we say we are talking about an ability, is something that you are able to do. Now when you are choosing a career, you must make sure you know your abilities. Number three sinama interests, what is the interest?

(Learners raise up their hands and teacher points one learner)

Learner: Interest are the things that you like to do

Teacher: Thank you my boy. Interest are the things that you like to do. Things that you like to do, Things that you like to do are your interests. Now, zihlangana njani abilities no interests no personality? Number one I said if you want to choose a career you must built your strength and your strength has to do with your social characteristics that simply means your personality, mentality physical appearance your dislikes and your likes, you build them. Ithi ngikwenzele example ne, let us say you've got an ability of playing soccer, strength. You've got an interest of playing soccer angitjho

Learner: Yes

Teacher: But awukghoni ukudlala ibholo that means you've got an ability in playing soccer but the skill of playing soccer and you want to follow the career of playing soccer, now what do you? You go and practice the skill of playing soccer and ube yi soccer star. You practise until you become perfect.

Learners: Yes

Teacher: Values? What is a value?

Learners: (Mumbling and no hands raised)

Teacher: A value is something that is important. Values are all the things that are important for you that is why they form your strength. Ngithe mina I strength sakho senziwa zizinto eziyi four. Your personality, your abilities, your interests and your values. And your personality is formed by your social characteristics your mentality, your physical appearance your

dislikes and likes Now in choosing a career, what you must do, you must make sure that you find all the types of careers before you choose so that you are able to choose. Now all types of careers nasiwa grouphako in one group siwabiza ukuthi ma career field. Now why do we call them a career field? A career filed is a group of careers, grouped together according to their characteristics. A career field is a group of careers grouped together because of their characteristics.

MRS MAKHAMBA LESSON 3 OBSERVATION LIFE ORIENTATION

(Teacher instruct learners to go outside for physical education training)

Researcher: Yini yi-PET?

Teacher: Yah.

Teacher: Alright come let's make a round a round a round (claps hands)

Learners: (learners gather to make a huge circle)

Teacher: Izandla phezulu. Hands up. Hands up.

Learners: (Learners put their hands up)

Teacher: Up hands up. Up. Niyazi the importance of doing warm up angitjho Why do we do warm up? We are stressing our muscles so that we are able to do exercises, we can't do exercises without a warm up angithi?

Learners: Yes.

Teacher: We must do a warm up so that you strengthen your muscles. And number two you can't exercise uthwele iskhwama is too heavy for you. Number 3 you can't exercise endaweni e dangerous.

Teacher: Phezulu.

Learners: (Doing the warm up exercise)

Teacher: If you are stretching your hands sideways and you can't move your hands it means something is wrong with you. If you are stretching your hands and you are touching the next person and you can't move your hands something is wrong.

Teacher: Hands up, down, up (repeat ten times)

Learners: (Doing the warm up exercise)

Teacher: Yah niyakhumbula last week ngitheni? Ngithe kunenye into esiyiza ngokuthi yi elevation angithi

Learners: Yes

Teacher: Sithe yini I elevation?

Learner 1: Mnyakazo

Learner 2: Elevation is to move

Teacher: Huh uh azange ngithi is to move. Sithe yini I elevation last week

Learner: Up and down

Teacher: Yah. Ngesikhuwa kukwenzani? To lift your body from the ground.

Teacher: Sithe senza four times. Siya elevator, yi rhythm yi rotation yi balance.

Learners: Yes

Teacher: Let's elevate. One, you lift your body from the ground when I say one you jump when I say two you jump twice.

Teacher: One,

Learners: (Jump once)

Teacher: Two

Learners: (Jump twice)

Teacher: Three

Learners: (Jump three times)

Teacher: Siya balancer ke. Siya balancer. Lift your right hand up

Learners: (Lift hands)

Teacher: Your right hand up, your right hand up

Teacher: Your left leg up. Senza I balance

Teacher: Right hand up. Left leg up. Balance is when you are doing an activity and you are not falling?

Learners: Yes

Teacher: Yes that means you are balancing.

(Learners balance)

Teacher: Exchange. No we move left right

(Learners move left right)

Teacher: Kusele ngathi yama minutes sikhambe siyokuhlala phasi?

Researcher: Eh 14 minutes

Teacher: Isese yinengi.

Teacher: Alright you are going to run

Learners: Yes

Teacher: Yah. When I say one u start running you close your gap?

Learner: (learner runs)

Teacher: skhathi bani?

Researcher: Its five past ten

Teacher: Ay seyitjhayile asikhambe

(Teacher leaves the learners in the sport field and heads to the staff room)

APPENDIX L
LESSON OBSERVATION (CASE 2)

LESSON OBSERVATION OF MR MABHENISA AT KHANYA SENIOR PHASE SCHOOL

MR MABHENISA LESSON 1 OBSERVATION TECHNOLOGY

Teacher: Yeey listen xxxxxx. Lets agree.

(Learners agreeing)

Teacher: Tell the class, why did you do make a project like that. Tell the class why u decided on the type of project you did. Tell the class, what was easy or what was difficult?

Learners: We decided to make this project because the project is beautiful… (Rest is not audible) go up, wen thing are not alright

Teacher: Explain to the class, what was difficult and what was easy when you made your project?

Learners: This one was difficult and this one was easy

Teacher: Xxx if you had to improve the tower which your group did, and why?

Learner: I can improve the lamp,

Teacher: Why do you have to improve it?

Learners: Because it is red

Teacher: What it is supposed to be like

Learners: Blue

Teacher: How much did you get in your group tell the class

(The unruly class distracted the teacher)

Teacher: Sit down… next xxx take your project

Teacher: Group 2 Tell the class, why did you do make a project like that. Tell the class why u decided on the type of project you did?

Learners: Because it was easy to build this tower

Teacher: What was easy and wat was difficult when you were making?

Learners: This was easy and this one was difficult

Teacher: If you had to improve, or if you had to make it better, what would you make it better on your tower?

Learners: This one, (Group members, help) Aerial

Teacher: Why areal, its is not

Teacher: Next, same question. Why did you make a project like that?

Learners: It was easy

Teacher: Why was it easy?

Learners: The hands

Teacher: Yes

Learners: The wires

Teacher: Was easy and difficult when you were doing it. Let's say you had a second chance what would you improve?

Learners: The lamp

Teacher: Do we call it lamp?

Learners: Yes no

Teacher: Next one

Learners: Class this is difficult, a bob drat, cardboard and its lighting

Teacher: However, when you looking at, is it straight, no do not fix it. If you had to improve, what would you improve?

Learners: The colour

Teacher: Okay sit down

Learner: I made this project, because …. And it was not exciting

Teacher: Why

Learners: Because others were not there

Teacher: If there any change or improvement, what wold you improve

Learner: I would fix here, because it is not straight.''

Teacher: Only?

Learner: Yes

Teacher: How much did you get?

Learner: 49

Teacher: What level is 49?

Learner: Level 4

Teacher: Okay sit down. Now listen, the reason I say these people need talk about it. Are we together?), is basically this. When you had the project, after you have done, it you need to talk about it, what was easy when you made it for your and what was difficult for you and how can you improve and where you can to better where you did not do good.

On the project, the difficult part, that I've observed many of the projects did not have a battery, bulb or a globe so they were not complete because for your tower to be complete, we agreed it must show a light you see, it must emit a light, so that at night it becomes visible

There is one thing you did not talk about, visual pollution; now when you make your project you need to consider the environment. Where your

tower is going to be placed, what kind of environment is your tower going to be placed. Did you think about that before you made your projects?

Learners: NO

Teacher: All these project that I see here, there none of the project that was using these guys…. Last time I said to you, if you put your tower lets say for an example in a nature reserve, what is a nature reserve, what do you find in a nature reserve?

Learners: Trees and animals,

Teacher: Now if you put your tower, where there are trees and animals, what is your tower supposed to look like?

Learners: A tree, so that the animals do not see the tower

Teacher: We said if your tower in a particular environment, your tower must be disguised so that the environment must not be polluted when they look at the tower. When the environment, people or animal who are around there, when they look at the tower they must not be visually polluted. All of them there is none that seem to be having these guys, to show it is try to avoid visual pollution you see, that is the problem. You see.

On your papers, on the assignment there, there are two drawings that you were supposed to draw, with your rough sketch the drawing you have in number one, you must not use the same drawing, and most of you used the same, which was the biggest problem. Your specifications, they saying list three specification that must be there on your tower and someone is writing calotype. Is the person correct?

Learners: NO

Teacher: You cannot write calotype. Calotype is a material that you are using when you build it ok

Learners: YES

Teacher: But, When we say specification, we mean something that is important when you build your tower that the people that are building the tower, must make to be there. For example it must have lights, if you say it must have a light, this a specification that mean when the tower is complete it must emit light, especially at night. The tower must emit light. This is what you specify this wat to a company, which will be making a tower for you. Xxxx where is yours, bring yours, you see what xxx has

Learners: Yes

Teacher: Its having?

Learners: Steps

Teacher: These steps are representing a ladder, you see. Therefore, if you are having steps like these, which in fact is a way of having, or making it easy for people to repair something or to put other things here on top or making it easy to climb on top of the tower, can you see

Learners: Yes

Teacher: Now these should be specification, you say the tower must have; steps or it must have a ladder so that, those who are repairing it, if it's broken they are easily able to climb up. You see?

Learners: Yes

Teacher: When you say specification, we are referring to these like these. Are we together

Learners: YES

Teacher: Because when you are looking at most of the towers when you looking at them we are having added thing up on top here, there must be a way of in order For receival of the signals network, so when they are having added things. Those things, how are they going to be added, the must be a way

of climbing up on top. When you looking at the tower, said the tower must be triangulated

Learners: Triangulated

Teacher: When you are looking at this tower is it triangulated?

Learners: No

Teacher: It is only this side that is triangulated, other side it's a gap, it's a gap, it's a gap. Now with a tower like this, can you say its very strong?

Learners: No

Teacher: You can't say it's very strong

Learners: Yes

Teacher: It's can't stand the force of gravity, it might fall because it's not reagent

Learners: Yes

Teacher: Right bring back my papers and bring back my papers.

MR MABHENISA LESSON 2 OBSERVATION TECHNOLOGY

Teacher: Good morning class,

Learners: Good morning sir,

Teacher: How are you?

Learners: We are fine sir

Teacher: On the board, I wrote the word structures, according to your understanding or knowledge, what is a structure? (Teacher repeating the question)

Learners: Something that is built in another shape

Teacher: Structure is something built in another shape or in a certain shape. Now how are structures formed? In which two ways are structures formed? How

are the structures made? What is the form of the way the structures are made? What is the form of the way the structures are formed.

Learners: Manmade and natural

Teacher: Good, those structures are manmade and others are natural. Now if we say they are manmade, what do you mean? someone may not understand, what do you mean when we say manmade, Yes

Learners: It is something that is created by another person

Teacher: It is a structure that is created by a person. Now when you say a structure is natural, what type of structure is that? Because the one you said it is manmade it is created by person, but the one you say is natural, what type of structure is that? Who creates it?

Learners: God, father God

Teacher: Hallelujah

Learners: Amen

Teacher: The natural one, who made it?

Learners: God

Teacher: Where you there, did you see God making

Learners: Yes

Teacher: The one you say it is naturally, it that when we were born, we found the structure on the earth surface. Those who believe in God say God made it. Are you a structure?

Learners: Yes, No

Teacher: Thank you, right, when you say structures are natural others are manmade, then let's start in the class. What type of structures do you find/see in the classroom.

Learners: Man-made

Teacher: What is man-made? In this classroom, are not having structures that are natural? Yes?

Learners: Fresh air

Teacher: Is fresh air a structure?

Learners: Wood

Teacher: Wood, is wood natural?

Learners: People,

Teacher: Right, now the question is, what are the examples of the manmade, that we find in this classroom, do not go outside, in the classroom

Learners: Chalkboard,

Teacher: Right

Learners: Desk

Teacher: Another one

Learners: Light

Teacher: Where is the light here, yes another one?

Learners: Ceiling

Teacher: Another one

Learners: Door, Wires, chairs, bricks, doorframe, uniform,

Teacher: Good now, we say these structures are not the same, they are different they come I different types, therefore what are the types of structures that we have?

Learners: Frame structure,

Teacher: Another one

Learners: Chair structure

Learners: Solid structure

Teacher: Now these are the three types of structures, are we together. Now the type of structure you are sitting on right now. What is it?

Learners: Frame structure,

Teacher: Why do you say it is a frame structurer?

Learners: Frame structurer because it protects us

Teacher: It protects you? I agree it protects you but why do you say it is a frame structurer? What is the desk made out of?

Learners: Wood and iron

Teacher: Is it having a shape or is it not having a shape

Learners: Shape

Teacher: Now, lets' go to number two, a shell structure. If you say a structure is a shell what do you mean? What kind of a structure is that, that you say its shell? Because if you say a is a frame is made of steal and wood or iron, is designed in a specific way. Then what is a shell structure? Is a shell structurer manmade or natural?

Learners: Natural

Teacher: It means we do not have a shell manmade structurer, are we? Look when we say we have structures that are natural and those that are manmade. It mean here we have a manmade structurer, the same applies to the shell, and we have manmade and natural. The same applies to… we have manmade and natural. Are we together?

Yes

Teacher: Good, right now in this classroom, what is the example of a shell structurer?

Learners: Doorframe

Teacher: Doorframe is an example of a shell structurer. If you remember, or you try to remember, what kind of a structurer do you say is a shell. If I say, describe it, what are you going to say. A shell structure, is a structure that contains things. In this class, what is a structurer that is containing things?

Learners: A school bag

Teacher: It means you are not aware that your school bag is a shell structurer, if you take of those books, it remains a shell and you use it to contain the books, that is why you keep the books inside, bedside your school back, what is the other things that contains, that you are having with you. Because when we say it contains, it puts things inside.

Learners: A class

Teacher: It's a class, a class is a shell,

Learners: The shoe,

Teacher: The shoes is a shell structure because it contains the ... what does the shoe contain?

Learners: The feet

Teacher: Now let's go to solids structure. In the class what is solid structurer

Learners: The bricks

Teacher: Yes

Learners: The door,

Teacher: The door, yes the door, are we together

Learners: Yes, the wall,

Teacher: Good. Yes the wall, now remember solid structurer is a structurer that is very hard to break. You cannot break it easily. It take a lot of effort to break. Take out classwork book on our desk

MR MABHENISA LESSON 3 OBSERVATION TECHNOLOGY

Teacher: Morning

Learners: Morning Sir

Learners: Morning Teacher

Teacher: Last time we spoke about different types of structures, and we basically talked about structures alright

Learners: Yes

Teacher: Now if you may recall, we said we have three types of structures. What were they?

Learners: Shell structures

Teacher: Yes

Learners: Solid structurer

Teacher: The last one

Learners: Frame structure

Teacher: Frame structure, alright

Learners: Yes

Teacher: Now, we need to understand one thing, that when we say we've got structures and we are having different types of structurers and we are having different types of structures. And on the on the board I wrote frame structure. Now in your textbook this frame structurer, they attend to it as a case study.

Now what is then saying to us, they want us to examine how the frame structures are., now the first thing we need to know most of the structures are built on frame and that is steal, when you look around, most of the structures we have, that are very very strong, they are steal structures those are the one we use when we build a lot of things.

Now when we saying steal, is because steal can last a long time. Now for a example, the purpose, the question here would be what is the purpose or what is the aim of a frame structure? The main aim of the frame structure is to, support what the load, it is to support the load. When we build, structure there is one reason for that, is for whatever we are going to be putting on the structure to be able to be taken over or hold on by the structure.

When you put a load on a structurer, the structure is not supposed to shrink or get broken that is why we say, the aim of the frame structure is to support the load. Now he question is what is the load? If the aim is to support the load, the question is what is the load, because we are saying frame structure it's aim it's to support the load or to carry the load. Now the question is what is the load? We spoke about the effort, we spoke about the load? You remember, what is the load? Like yourself, do you carry things?

Learners: Yes

Teacher: What do you call the things you carry?

Learners: Load

Teacher: What is this?

Learners: A bag

Teacher: It's a bag, are we together?

Learners: Yes

Teacher: You put your books inside. And then you carry it, now when it is empty and when it was carrying books, is it still the same?

Learners: No

Teacher: What is the Problem? Xxx Why is it heavier, than when it was not having anything?

Learners: Because it has books inside

Teacher: Because it has books, what do you call the books inside the bag?

Learners: Books

Teacher: The load is the weight that you place on a structurer, you see, now it means whatever structurer you have, when you put the load on it, that structurer must have the power to carry that particular load. Then we say, the only structurer that is able to carry a load more better, its frame structure and a structure that its built using the steal is the one we say, it can carry more heavy load, than any other structure you see. You look up there, we have a structure built on top here before they put the ceiling

Learners: Yes

Teacher: Where is the ceiling, hatching on. On what is the ceiling hatching on? What is the ceiling attached to or balanced to?

Learners: Wood

Teacher: It is attached to wood, and this wood are a frame structure but they are not strong as compared to a steal, can you see

Learners: Yes

Teacher: That is why they are able to carry the load. This structurer can carry the load under it and also on top of it. And when you look through, besides the ceiling, there are other things there are sponge inside can you see

Learners: Yes

Teacher: And on top of frame structurer there are corrugated irons to protect the structure so that it does not curve inside and also for the water when it's raining its does not curve inside or the wind not to enter inside

On your textbooks, let's check something we must look at. On your textbooks, there are examples of a structurer, open page 78 of your textbook. When you are looking at page 78, they are telling us that there are three structures that we need to look at. Now wat do we do, we need to do is to examine, the way these structures are built

1. When you are looking at the first structure, what do you see there, what is the type of structure that you see, what is the name of the first structure that you see? Yes xxx
    a. The frame structurer, it is pilot structurer
        It is electricity pilot
2. What is structure number 2
    a. It is a windmill
    It is a windmill

3. What is structure number 3
    a. It's a mind head gear
    It's a mind head gear

Now what we need to do about these structures, look at the structure there. What you need to focus on is how the structures were built, when engineers are creating the structures, there are only certain instructions given to them, one of them is that the structure must be strengthen. Now if the structurer has to be strengthen, it mean the structure must be made such that it will never brake very easily and it will last a long time. Now in order for the engineers to build a reasonable structurer, the structurer must be strengthen.

Now, what are the methods in strengthening the structurer, look at structurer number 1, electric pilot, what shapes do you see? Yes xxx

Learners: Triangle,

Teacher: You see a the shape of a triangle; This triangle shape it's an indication, that when engineers were building they decided this structure were making a understanding of triangulation system. It means, they used a triangulation system in order to strengthen.

Now, you look at the windmill there, what do you see on the other side of the windmill, what shape do you see on the other side of the windmill. The shapes

Learners: Square

Teacher: There shapes that are indicating of a square now when you look, what are those shapes supposed to be used for in your thinking, why do you think are indicated on one side only and not all side. What are going they used for? Yes xxx

Learners: To have a balance

Teacher: Yes, in a way it could be to have a balance, but the main reason it's for repairs to be done easily. Now whenever a structurer is built, there always something you must remember that sometimes the structure can be affected or can be broken or it will need repairs on top there, where it carries a lot of load. Now when you see number 1 Power lines that are being attached to the pylons. Now these power lines are the ones that we call loads on the structure.

Now you look at the windmill, the top of the windmill the one that is circulating it's also a load on the windmill, you see

Learners: Yes

Teacher: Now if there is a need for repairs, when you look at the structurer number 1, the triangles there, those who are repairing, they can easily climb up through using the triangles. You see

Learners: Yes

Teacher: Now look at structure number 3, the headgear, usually this one is the one that is used in the mine. Now when it is used, the build it is not the same as the others but the strength it should be very much strong. Because in the mines you find that there are tremors or there shaking of the earth. If there is shaking of the earth it means sometimes the top soil can curve inside the mine, in case like that those who are making head gears must make sure that it is very strong. The day an incident occurs under the ground in the mine it must not fall under ground. You see

Learners: Yes

Teacher: Look at the way of strengthening the headgears, how is it like? When you looking at the way of strengthening headgear, how did they strengthened it, what method or system did they use?

Learners: Frame

Teacher: What system did they use, now if you check there, they've used rectangle and this rectangle it's having diagonal lines. Now we said the other time, when we make different structurers using the papers that a diagonal line move from one corner to the other corner. Now when you check on the headgear they crisscrossed the diagonal lines to make sure the strength of the headgear becomes very strong. Now check on the next page,

What do you see? Are the same structures that are on the previous page, but what did they do? They only brought closer the view of the strengthening of the structures, they are showing you there, they brought then closer. So that you are able to see how strong have they been built,

when you look at them at a close range. Now you looking at these three there, look at the one at the centre, you see the one at the centre.

Learners: Yes

Teacher: Look at how they used, bolt and nuts to fasten it, so it will never break very easily. Now what are other things that you observed are put on top of the structures for example in a cell phone tower for an example. Which loads are placed on it, what is it they put on a cell phone tower as a load, what is that? When you look at the cell phone tower, there are things that you see on top there what is that?

Learners: There are satellite

Teacher: They are satellite, there are some cell phone tower that are having dishes, others are aerial, you see, these things when you see the put on top of every frame structure especially the one that is built on a steal, the purpose is for them to do the job that they are built for, we now saying the load that is carried by these must not be heavy such that these structures are unable to have hold them, that they end up falling down. So that is why we say, the engineers they must use strong strengthening methods so that the tower could be strong and rigid.

Now this word rigid, what does it mean in your understanding, when you say the tower must be rigid, what do we mean? What is supposed to me? There are certain elements that we said we must consider when we build a structurer and those elements are elements that make the structure to stay the way it should. So that if there is a strong wind, it will not fall down. What are those things? What are those elements that structure needs for it to be balanced? What are they? Xxxx

We said the base of the structure, it must have the strong base and wide and at the top it is not going to be wide, it is going to be slim, because at the bottom is wide so that it has a sufficient balance and stability

Now you need to focus on one thing, take your book, classwork book

1. Write types of structure
2. Environment, where the structure us placed
3. The materials

You need to draw the table, columns:

1. Pilot
2. Windmill
3. Headgear

1. Now your, type of structure, you need to write what type of structure is pilot made out of?
2. Now your, type of structure, you need to write what type of structure is windmill made out of?
3. Now your, type of structure, you need to write what type of structure is headgear made out of?

1. In which environment do you find pilot, you write the environment
2. In which environment do you usually find windmills, in which area do you find windmill, where can you find it.
3. Headgear, where can you find it

1. What are the material that were used to make the structures
2. The method of making the structures strong and rigid

APPENDIX M
LESSON OBSERVATION (CASE 3)

LESSON OBSERVATION OF MR MPHOPHOTHO AT KHANYA SENIOR PHASE SCHOOL

MR MPHOPHOTHO LESSON 1 OBSERVATION NATURAL SCIENCE

Teacher: (giving instructions per group). Last time I gave, you work on page number? It was on page what

Learners: 80,

Teacher: 80, activity 3.1 right, open your textbook on page number 80. Can you read question number 1, on page 80

Learners: True or false

Teacher: True or false, where is xxx, xxx give us answer for question 1

Learners: Xxx: False

Teacher: Correct, give a reason for that

Learners: Because ……

Teacher: Xxx Read the answer in your book. Right can you all read number 2

Learners: What is recycling?

Teacher: What was the answer there? Yes my xxx

Learners: Recycling is to break things or to recycle

Teacher: Yes, lets get another one

Learners: A process of using waste material to make new material or product.

Teacher: That's very good, that is a way of using old things that we have used, right we take it back to the factory and they recycle it right! And we are going to use it again. That is a way of recycling; now remember our explanation is going to not going to be the same. But now if the explanation is not the

same. But then idea should be the same. Do you understand what am I saying. We are not unique; we are not going to explain things similar but the idea should be the same. Alright

Learners: Yes

Teacher: We say now, recycling, in this what you call, is different to reusing, right!? Items other words we saying the way in which you have explained it is correct. The idea should be that now the old material has been taken back to the factory to reuse it again. To manufacture it and to reuse it again. You understand what am I saying

Learners: Yes

Teacher: There are old women and men that use to move along the road, colleting tins and bottles. They are taking those tins and bottles for recycling. You understand what am I saying?

Learners: Yes

Teacher: The purpose of buying or to throw those containers is because they have use what was inside those containers. The purpose was, to get what was inside those containers. Now they throw those containers. Then now people now collect those containers. Remember what I said, as you move along Kwaggafontein there is a dumping zone, and I mentioned other dumping zone. Thank you. Can we look at question number 3, read question 3

Learners: Why is it important to separate, the rubbish if you wish to recycle

Teacher: Remember, what I said, when you need to recycle, we are collecting items of… Items, which are the same, think now, back to our mixtures, do you still remember how to separate mixtures?

Learners: Yes

Teacher: We are having gramographs; we are having hand sorting, all those things, right! Then you must have them again in your minds whenever we are doing the recycling. Items, which look similar, or the same item should be put together. Angithi wathatha irecycle wathatha amabodlela, wafaka amaphepha, amabox ngapha (When you take recycling, you take bottles, papers and boxes and separate), all those things. You sort your items according to their characteristics. Similar items you put them, then there after you put them in bulks and you call recycle people to come and collect those bottle or whatever material it is. Are we together there.

Learners: Yes

Teacher: Now the answer there, they saying materials cannot be mixed during the recycling. I have explained that, we put things together. That is why even here at school, in the staff room there we have a box where we put the papers. We take the papers to the library there is a big containers, we put them inside for recycling purposes. We do not anything there, we put only strictly papers. Did you understand it?

Learners: Yes

Teacher: Is it fine? My xxx at the back, read your answer for question number 3. Do we have those that did not write?

Learners: Yes

Teacher: I gave you the textbook, I said the work must be finished

Learners: NO

Teacher: Those who did not complete the work, must come forward others must mark. Let continue, we are at question number 4, can you read number 4

Learners: Explain how waste is managed at the waste site

Teacher: Yes, they explain. Give us the answer, give us the answer. Yes my xxx

Learners: It is wasted because people find it useless

Teacher: Can you read the question again, let us read the question again

Learners: Explain how waste is managed at the waste site

Teacher: Read the question again because, you are not clear as to what you are reading.

Learners: Explain how waste is managed at the waste site

Teacher: Explain how waste is managed, explain how the waste is managed, and the answer is what? My man, we have heard your answer another one read the answer for us, yes my xxx

Learners: The rubbish must be checked

Teacher: Right. They say the length field site is managed properly the rubbish will be dumped and compacted. If we throw the rubbish bin at our homes and we dig a hole, then we throw everything there, usually what do we do when we feel that it is full? We take the soil and we close the hole. Then we make another hole next to it. That's how we control it. So now, if you move in the dumping zone usually they take now a bulldozer, tey sed dozer the make what we call that big open spaces, they put everything there. When they feel that the length field site is full. Then they will take the soil back and will cover the top part. Do you understand what am I saying?

Learners: Yes.

Teacher: Read question number 5, they never said how many sentences you must write. Right read question number 5…

Learners: If what happens at the length field is not managed properly

Teacher: If the rubbish is not computed daily, what will happen, it can be blow by wind. If you just throw them there. Do you want to give an answer?

Learners: People can …sin

Teacher: People can what? And what else

Learners: The area, will be dirty with the rubbish

Teacher: What else

Learners: Pollution,

Teacher: Pollution right, is going to be exposed. So remember we do not want to pollute the surrounding. It is very much important to make it a point that our surrounding is conducive, therefore we must prevent that, we must prevent pollution. Whenever we dump something there, and we leave it, whenever there is wind the wind we blow the rubbish and our surrounding is polluted. We go to question number?

Learners: Six

Teacher: Leave question number 6, you mark and then you submit your book. If there is a question you do not understand, please raise your hand and I will come explain it to you.

MR MPHOPHOTHO LESSON 2 OBSERVATION NATURAL SCIENCE

Teacher: Right listen, I said there is a table that …… That table is not marked when you receive your books, there's a work I want us to do.

Learners: Yes

Teacher: Look on page number 181, mining and waste management, look at number 1, you all read from top, career in chemistry, mining and waste management all of you

Learners: Career in chemistry, mining and waste management (Learners reading)

Teacher: Right, you all read the first paragraph and then, thereafter we will explain it. Read it please

Learners: Chemical, mineral, and technicians in a chemical industry deal with excessive raw material into useful and valuable products (Learners reading)

Teacher: Yah, continue

Learners: Chemical and engineers work in a range of industry food processing, water purification and lastly manufacturing

Teacher: Right, before I explain that, I want you to look at the photos below, we are having 4 photos in there, do you see them? Let say now, we take the first photo, we take them in sequence as they are. You go to number two followed by 3 and 4. Alright

Learners: Yes

Teacher: If you look at photo number 1, what do you see there? Or what do you think is happening there? Photo number 1. Yes xxx

Learner: I see women, carrying some materials,

Teacher: According to you, my xxxx can you guess what type/kind of material is that one

Learner: I see a chemical engineer

Teacher: You see a chemical engineer, what is she or he doing

Learner: She is doing the ….

Teacher: Alright, okay its fine she is doing chemicals or working with chemicals okay, and what else, we on picture number 1.

Learner: I think, an engineer is studying a mechanical sample

Teacher: Studying, mechanical sample, right let's look at number 2, below u number 1. What's happening there

Learner: I see the man, is writing down the chemical

Teacher: Okay, in other words, he is writing down the outcome, the result. And what else can you say, diagram 2? Okay diagram number 3

Learner: I see the man, working are mine, they take the coal they place …..

Teacher: Why do you use symbols? Yah

Learner: I see geologist are shaking simples in gold mine

Teacher: In gold mine, right. Let's look at last one diagram 4, at the bottom extreme right

Learners: The chemical engineer try to assist the process with manager at the recycling place

Teacher: Right, you see through pictures, you can write a story, you can write something through the pictures you see or you look at the pictures and then you interpret the what you call the information that is discussed now or that is shown through the picture, that is why if you check on top there, they say career in chemistry, mining an waste management. In other words those pictures there they are now showing careers in chemistry, in other words one of the picture there they are dealing with the chemistry alright

Learners: Yes

Teacher: Secondly there is a picture of mining and thirdly there is a of waste management. Waste management, remember we talked of the way in which you going to control the waste materials. Now I want us now, to go further, look at the next sentences. Can you read form just one examples of, do you see that sentence?

Learners: Yes

Teacher: Start there…

Learners: Just one example of a chemical in the mining industry in a operating manager. They are required to manage mining production and to ensure

that the work is done safely and that the minerals are. Mine managers are required and mining operation (Leaners reading)

)Teacher: They are talking about a manager, what can be the function of a manager? Or what is a manager

Learners: Manager is a someone who is above the boss.

Teacher: Who is the boss? Maybe could be…Yes xxx

Learners: Manager is someone who guides the workers.

Teacher: Someone who guide the workers, that's very good, look am the manager presently, am guiding and we have ma'am here, ma'am at the end of the day ma'am when we are there, ma'am is going to say Mr xxx here, you do this and this, she is guiding me. She is here for a particular purpose. Who is the manager here at school?

Learners: The principal,

Teacher: The principal is the manager at school, you understand?

Learners: Yes

Teacher: You move to a soccer field, we are having a captain is the manager and we have a … he is managing the players, you understand what we are saying?

Learners: Yes

Teacher: Thank you very much. I want us to turn over to the next page, classroom activity number 7, question number 1. Read number 1

Learners: Any mixture, can be separated, using any separating method, example.

Teacher: What can you say?

Learners: False

Teacher: Is it true or false

Learners: False

Teacher: Is it true false?

Class indecisive: it's true it's false

Teacher: Understand the question first? They say any mixture can be separated using any separation method. The should be answer is False. You cannot use hand sorting for separation of colours, you cannot, therefore it is false. Read question number 2

Learners: Illustrate

Teacher: What can you use there? Read question number 4.

Learners: What properties, must a mixture have, if it is to be separated by the magnetics properties?

Teacher: Properties, characteristics. What are properties of the object which can be or the method which can be used as a magnet to separate objects. We want the characteristics which we can use as method, which is magnetic or magnet too separate? Last, we talked of magnet, isn't?

Learners: Yes

Teacher: And magnet, does not or is not used to separate any objects? There are those objects, that we can use magnet as a method to separate them. Now, those we call magnet, which characteristics?

Learners: Oh

Teacher: Thank you, hands down boys, can we move to question 5

Learners: Explain why a filtration method is a method of separation of a mixture of sand and water?

Teacher: Remember, last I gave you work I said write 4 methods, and explain each one of them, so now they are talking about filtration here. If you page backwards, there is a filtration method, page number

Learners: 73

Teacher: Filtration, page number 71. You see it on page number 71?

Learners: Yes

Teacher: Right, let's continue, look on question number 6, read number 6

Learners: Mabu, lives near the sea, he is curious to see if can get the salt out of the seawater.

Teacher: Read it again.

Learners: Mabu, lives near the sea, he is curious to see if can get the salt out of the seawater. Explain how Mabu, could carry our an investigation on site laboratory

Teacher: Who was once in Durban?

Learners, excited and raising hands

Teacher: How is the taste of the seawater?

Learners: It is salty?

Teacher: It is salty, isn't, then it means it has got salt. Now they say how can we… right, you can make noise, at the end you going to answer this question. Can you read number A. Explain How?

Learners: Explain how Mabu, carried out the investigation in the site laboratory to get on seawater

Teacher: B

Learners: Why would Mabu, observe during …. on an investigation

Teacher: C

Learners: Give a scientific explanation for what Mabu will observe.

Teacher: Right, check question number 7

Learners: A liberation is not a table method if you need to correct a problem from a solution

Teacher: Yah

Learners: Explain why it is the case.

Teacher: Next one

Learners: Which method of separation can be used if you need to correct a problem from a solution?

Teacher: Number c

Learners: Explain, why the method is 7B, is more suitable

Teacher: Number 8

Learners: Explain what happen to water in a big in r

Teacher: Yah

Learners: Explain, how a litre of water and method can be separated

Teacher: Read number 10

Learners: What is the water?

Teacher: That is our next work, I will make notes for you

MR MPHOPHOTHO LESSON 3 OBSERVATION NATURAL SCIENCE

Researcher: Are students outside?

Teacher: Yes

Teacher: We are going outside; I want us to finish the practicals. Let's listen, We will take 5-8 Minutes. We all go outside, you group yourselves into groups and then, thereafter we come back, and when we come back, listen to what I say, when we come back. We are going to sit in groups. This group or

these two rows, you will make your groups and you come and occupy these two rows. Are we together?

Learners: Yes

Teacher: Then please, we are not going to change the position or the desks let me say that. So if you form a group of 8-10 and then you will sit or perhaps occupying this part, are we together as applies to the other group. Are we together?

Learners: Yes

Teacher: This is the paper; so now on this paper it's written Surname, which I am going to give to you when you come back. I want now one learner, and that learner will appear on top of the list and that learner will be a group leader, is it fine?

Learners: Yes

Teacher: Am saying am giving you 5-8 minutes, you go outside, form the groups and when you are ready, come back and I will give you this paper. This paper at the back has question and space for answers

Learners: Yes

Teacher: Now, when we fill up this, remember we have done this previously in our classwork books. Right

Learners: Yes

Teacher: Now in-groups, you take your classwork, you work now or we work as a team all the 8-10 members, you work together and you share ideas. You look into your classwork books and look at this practical activities we have dealt with it. Right then thereafter, you answer all the questions on the same question paper, alright?

Learners: Yes

Teacher: Can we go please?

Learners goes outside

Teacher: Group of 8-10, not more than 10

APPENDIX N
EDITORS COMFIRMATION LETTER

Academic consultancy
"Perfection is our DNA"

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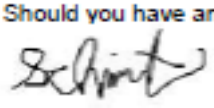
13 October 2019

To whom it may concern

This letter is to confirm that I, Keegan Bruce Schmidt, freelance copy-editor, have edited and proofread the ***dissertation, 'integration of environmental education by senior phase teachers in some schools of Nkangala district' by Lettah Sikhosana'*** grammar and spelling.

I have not changed any of the ideas presented in this proposal, only the grammar and spelling has been altered for the purposes of clarity. This is to confirm that I have edited the document to a level I deem satisfactory.

Should you have any questions feel free to contact us



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APPENDIX O

TURNITIN REPORT